HELSINKI SCHOOL OF ECONOMICS (HSE)
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HOLIDAY EFFECT IN THE FINNISH STOCK MARKET

Evidence and Tests of Plausible Hypotheses

Finance
Master´s thesis
Sami Listola
Spring 2004

Approved by the Council of the Department 25 / 5 2004 and awarded the grade good 70 points

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Abstract
May 18, 2004

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PURPOSE OF THE STUDY

The objective of this Thesis is to present the commonly known holiday effect and the underlying financial theories as well as to introduce and discuss earlier international studies on holiday effect and other calendar anomalies. The primary goal of the Thesis is to examine whether holiday effect existed in the Helsinki Exchanges between 1991-2003. Furthermore, the study aims to spot the relation of holiday effect to other calendar anomalies.

DATA

The theoretical part of the paper is related to the contemporary finance literature. The data set of the study consists of daily closing level return series of HEX All Share and Portfolio indices from January 1991 to November 2003. The daily stock returns are computed as logarithmic price relatives. The returns are also adjusted for cash dividends and stock splits.

RESULTS

The main finding of this study is that there is a statistically significant pre-holiday effect for both All Share and Portfolio Index in the Helsinki Exchanges. Stocks averages abnormal returns one trading day prior a holiday. The pre-holiday return is 32 to 45 times higher than the return on ordinary days for given indices. The impact of pre-holidays on holding period return is substantial, accounting for 69% and 55% of the continuously compounded return, respectively. Post-holiday strength is evident one day after a holiday only for Portfolio Index.

The study also examines the independence of the holiday effect. Pre-holiday effect is found to be independent of other calendar anomalies. On the other hand, the post-holiday effect is related to small firm January effect. However, together pre- and post-holiday trading days explains 90% of the past 12- year's compounded returns.

KEYWORDS

Anomalies, Holiday effect, Equity return, Market efficiency, Regularities

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"One of the earliest and most enduring questions of financial econometrics is whether financial asset prices are forecastable. Perhaps because of the obvious analogy between financial investments and games of chance, mathematical models of asset prices have an unusually rich history that predates virtually every other aspect of economic analysis. The fact that many prominent mathematicians and scientists have applied their considerable skills to forecasting financial securities prices is a testament to the fascinating and challenges to this problem. Indeed, modern financial economics is firmly rooted in early attempts to "beat the market", an endeavor that is still of current interest, discussed and debated in journal articles, conferences and at cocktail parties!"

(Campbell, Lo and MacKinlay, 1997, p. 27)

1 INTRODUCTION

1.1 Background

Different calendar anomalies have been investigated world-wide for over half a century now. It is surprising to many that these market frictions have not vanished after all these years. According to various financial theories these profit opportunities should disappear after they have been discovered. Efficient market and arbitrage pricing theories make an assumption that investors start to make opposite movements against these anomalies. These controversial movements should lead the market prices toward the equilibrium in a way that anomalies would not exist.

A conclusive body of literature documents that seasonal patterns affect the return-generation process for equity securities. Financial theories acclaim that seasonalities are result of inefficiency in pricing. This can lead to profit opportunities but these opportunities should vanish after they become widely known. The market, on the contrary very well knows the anomalies, but still recent studies show that these pricing discrepancies are found in various markets. Stock market anomalies are commonly classified into fundamental and seasonal anomalies. Fundamental anomalies include firm specific variables such as size, P/E ratios, dividends and share price. Seasonalities, i.e. calendar anomalies include day-of-the-week, turn-of-the-month, intraday, January and holiday effect, among other seasonal phenomena.

This study concentrates on the *holiday effect*. The aim of the study is to determine, whether holiday effect is found in the Finnish stock market. Further evidence of differences between Finnish and international markets is also gathered. The study also tries to carry out pioneering research with Finnish data to find whether the holiday phenomenon exists.

Since mid-1970's empirical literature has documented significant anomalous regularities in stock market returns. One of these empirical findings reported is abnormally high stock return before holidays.

For example, Pettengill (1989) examines return patterns around holiday closings on the New York Stock Exchange (NYSE) and identify unusual return patterns around holiday closings. Many studies have also examined post-holiday returns. Several studies report the existence of the pre-holiday effect but results for post-holidays are lot more controversial. For example, Pettengill (1989), Lakonishok & Smidt (1988) and Ariel (1990) report higher returns observed on pre-holiday trading days but don't observe higher post-holiday returns. However, Pettengill (1989) reported higher post-holiday return for small firms and Easton (1990) reported high post-holiday returns for Australian stock indices.

The findings are particularly interesting in the light of the Efficient Market Hypothesis (EMH). According to the theory, seasonalities should vanish as soon as they are found to exist. Efficient functioning markets are expected to react on the inefficiencies, which causes them to disappear. Some studies report that recently pre-holiday euphoria has vanished and the market has performed efficiently, e.g. McGinnis & Vergin (1999) found that a phenomenon that once helped stock traders to make a killing in the market before holidays -- appears to have taken a holiday of its own.

According to EMH market participants should promptly become aware of the possible discrepancy on the pricing and profit. As soon as the phenomenon becomes publicly known, no profit opportunities will remain as market participants adjust to it. Since most asset pricing models are based on the efficient market hypothesis that leaves no room for seasonal stock return patterns, the existence of holiday effect may further erode the basics of the EMH. Even the weakest form of market efficiency states that the market will price away any

anomalies that are related to historical transaction data. Therefore, for the EMH to hold, any observed holiday irregularities in stock return patterns should be corrected.

1.2 Motivation for the Study

As one of the oldest reported seasonal anomalies, holiday effect is still very interesting especially its existence in the Finnish stock market. As mentioned a lot of research on seasonal anomalies has been carried out internationally and to some extent in the Finnish stock market. However, holiday effect has not been earlier studied with Finnish stock market data.

After Fields (1934) first documented the holiday effect in the US stock market (Dow Jones Industrial Average between 1915-30), there was a long gap before other academic literature were published in the late 80's by Lakonishok and Smidt (1988). In 1990 Ariel documented very high pre-holiday returns for CRSP value-weighted and equally- weighted indices. This comprehensive study also reported that high pre-holiday returns are not a manifestation of other calendar anomalies such as January or weekend effect.

Since then, in the mid 1990's several holiday effect studies have been conducted with international data from large stock markets. And in addition most of these studies use global holidays or more significantly US holidays. Surprisingly, no extensive studies with Finnish, market data have been made, though. This is interesting because foreign studies show very convincing results and in light of them the effect should not be overlooked. It is in interest to finally study the holiday effect and that way interpret the market efficiency. The markets differ significantly, the microstructure of the market are different in terms by, e.g. size, trading rules and even holidays. These facts may change the nature and appearance of holiday effect. The structural differences make harder to apply these results from one market to other. Moreover, in recent years financial markets, especially in Finland, have experienced huge fundamental change in terms of electronic trading systems and fallen transaction costs. In some terms markets have become more efficient through fast information delivery. Also new market participants have come into play, international investors have become active members on Helsinki stock exchange and totally new segment of investors were born in the late 90's by popularized low cost online retail investor services. This study aims to spot the differences, if any, between Finnish and international evidence.

1.3 Objectives of the Study

The purpose of this study is to investigate and test empirically seasonal regularities relating to the days around holidays (*holiday effect*), days preceding holidays (*pre-holiday effect*) and days after the holiday (*post-holiday effect*), in Helsinki Exchanges.

At first we identify some characteristics of the history of stock market anomalies as well as the framework for the holidays that are included in this study. The aim in this study is to test whether the stock returns higher returns on the day preceding holidays and are the return patterns different on post-holiday trading days. The relationship between mean pre-holiday/post-holiday return and the mean of ordinary days return will be analysed using statistical methods. On the other hand this study concentrates on the frequency and variance of holiday period stock returns. Also some liquidity measures, volume and turnover, are used as explanatory variables. Some other factors such as bid-ask spreads could be used but these variables have been however left out so the focus will remain. The market data is being analysed to detect any regularities within days around holidays.

The data consists of almost 12-year period on the both sides of the decade. During this time span Finnish stock markets have experienced sharp increase in the trading volumes and have develop in terms of efficiency, e.g. long-term short selling has been enabled. Also all kind of market conditions has gone through during the time span under review. Given relatively long time period, results can hardly be attributed to a certain market conditions. The study is first of kind in a sense, that no paper has examined holiday effect around Finnish holidays with Finnish market data during this period.

Finally, I aim at providing guidance to finance practitioners as whether holiday effect should be considered in trading decisions. At least to short-term traders any anomalies in return distribution generate profit opportunities. Holiday effect is also related to other calendar anomalies, such as the day-of-the-week and turn-of-the-month effect, and the true independence of the holiday effect is tested to give additional explanations to this phenomenon.

The purpose of this paper is to investigate the existence of holiday effect in the fairly small Finnish market place. The study concentrates on behavior of stock returns. Also share volume and turnover is analyzed. I consider volume and turnover as very important and helpful explanatory variables that are surprisingly excluded in most of the international studies. A substantial body of research on the holiday anomaly has emerged over the years. The prior evidence shows strong existence of pre-holiday effect and in few cases post-holiday effect. The goal of this study is to find answer to the following interesting questions:

i) Does commonly known holiday effect exists in fairly small Finnish market place on public holidays?

ii) Does U.S. national holidays affect Finnish stock return and volume patterns?

iii) Is the possible holiday effect independent in relation to other calendar seasonalities?

This study uses stock index data to analyze the holiday effect. The use of this data gives an overall view of the market. Also, taking into account the liquidity gives even more causes and explanations for holiday effect.

1.4 Structure of Study

This was an introduction to the theme under review. The remainder of this paper is organized as follows. Theoretical part of the study begins in chapter 2 that presents the random walk and efficient market hypothesis. The definition is helpful in understanding whether regularities in return patterns violate the efficient market hypothesis. In chapter 3, I introduce and look at previous studies of seasonal stock market anomalies, concentrating on holiday effect and other calendar anomalies. Empirical part of the study holds chapter 4 describing the sample data. Research hypotheses are presented in chapter 5. Chapter 6 explains the research methods and chapter 7 presents the empirical study results. Chapter 8 summarizes and concludes the study.

2 MARKET EFFICIENCY

Chapter 2 explains the theory of efficient capital markets. The *Efficient Market Hypothesis* (EMH) states that at any given time, security prices fully reflect all available information. The implications of the efficient market hypothesis are truly profound. Here is a definition of the efficient market made by Eugene F. Fama in his Ph.D. dissertation (1965):

"An 'efficient' market is defined as a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value."

2.1 Hypothesis

In efficient markets it is not possible to benefit from mispricing on constant basis. Prices are will move towards equilibrium when investors try to profit from these market frictions. According to efficient markets the price change of a security from one period to another should be random. This implies that change in price, which takes place today should be unrelated with the change in price yesterday or in any other day in the past[1].

One way to test the market efficiency is to form a specific trading rule and then test it with the historical return data. The testing will indicate whether profitable rates of return would have been produced in the past. In order to run this test an appropriate benchmark has to found which could be a problem. The benchmark is used to determine whether excess returns have been produced. The primary goal of the test is to find out if the excess returns generated by the buying and selling strategy would exceed the transaction costs. If the buying and

[1] The random deviations in stock prices are however somewhat violated, if there exists serial correlation in equilibrium prices and expected rates of return (Haugen, 1995).

selling strategy would not yield excess returns after transactions costs, it is considered as inefficient. This is often seen as the obvious reason why investors have not started to benefit form calendar anomalies.

2.2 Forms of Market Efficiency

Fama (1970) describes three forms of market efficiency. The weak form includes all past stock price information to current stock prices. The semi-strong form of efficiency considers all publicly available information: i.e. annual reports, press releases, company announcements to have been reflected in current stock prices. The strongest form of efficiency incorporates all available information. This means both public and inside information is fully reflected in current stock prices.

What comes to calendar anomalies and especially holiday effect, already the weakest form of market efficiency assumes that the market will price away the holiday effect. Basically, this implies that the investors, who use historical data of stock prices, will recognize the patterns and when they try to benefit from them the market will move back to equilibrium.

It is important to bear in mind the assumptions of the market conditions that have to hold in order to these three forms of market efficiency described by Fama (1970) to hold. The assumption made of market conditions are:

I. No transaction costs

II. All available information is costless and available to all market participants

III. All investors agree on the implication of current information on the current prices and distributions of future prices of each security

If all these conditions are met, the current price of a security "fully reflects" all available information. However, the markets met in practice seldom fulfil the criteria listed above. Fortunately, these conditions sufficient for market efficiency, but not necessary. For example, markets may be efficient if enough large number of investors have ready access to information. But if there are investors who can continuously make better profits by having a

monopolistic access to information, the markets are clearly inefficient. The same logic goes for transaction costs and the agreement among investors about the implications of given information. To conclude, all these three conditions exist to some extent in real world markets. The goal of empirical work in this area is, however, to measure their impact on the price formation process. Fama (1970)

There are three versions of market efficiency:

1. The ***Weak form*** states that all past market prices and data are fully reflected in securities prices, i.e. technical analysis is of no use. This means, e.g. that if it is publicly known that the stock prices rise on pre-holidays and fall on post-holidays investors should start utilizing the fact in their investment decisions and by selling on pre-holidays and buying on post-holidays. Under the weak form of efficiency, the holiday effect, and other calendar anomalies as well, should be priced away.

2. The ***Semi-strong form*** asserts that all publicly available information is fully reflected in securities prices, i.e. fundamental analysis is of no use.

3. The ***Strong form*** says that all information is fully reflected in securities prices. In other words, even unpublished insider information is of no use.

As what comes to this study and holiday effect, the weak form of the EMH is considered because any seasonal patterns are especially based on the idea that past price movements can be useful in identifying future movements.

According to random walk theory the past movement or direction of the price of a stock or market cannot be used to predict its future movement. The theory also believes stock price changes are independent of each other and have the same probability distribution, but maintain an upward trend over time. Any new information that could be useful in determining a stock price is already reflected in the price.

Random walk process is also known as Brownian motion as a function over time.

Mathematically, it can be formulated in the following way:

(1) $$P_t = \mu + P_{t-1} + \varepsilon_t \Rightarrow r(t-1,t) = p_t - p_{t-1} = \mu + \varepsilon_t$$

Where P_t = natural log of a stock price at time t

μ = expected drift

ε_t = random disturbance term

$r(t-1,t)$ = actual return for the period $(t-1,t)$

3 REVIEW OF LITERATURE

3.1 Classification of Calendar Anomalies

This study investigates one of the largest regularities and seeming anomaly, called holiday effect. A considerable amount of studies report the presence of abnormally high stock return on the day before holiday. For over 30 years, an increasing number of studies have investigated stock market anomalies. These several studies have documented strong evidence that common stock returns exhibit seasonal patterns. These seasonal patterns are difficult to explain from asset pricing theories and are not rationalized with efficient market hypothesis (EMH). These calendar anomalies include seasonal regularities relating to the time of the year, time of the month, day of the week and days around holidays. More exotic seasonalities have also been reported, e.g. lunar cycle effect by Yuan, Zheng and Zhu (2001), presidential cycle effect by Stovall (1992) and Friday-the-thirteenth effect by Agrawal and Tandon (1994). Various researchers have carried out studies to determine whether these calendar anomalies still exist.

In this chapter of the study, different seasonalities are introduced. Selected seasonalities, discussed in more detail, can be seen as relevant and helpful for identifying the independence of given anomalies. Later in the study the independence of the possible holiday effect is tested to decide that whether that is just a manifestation of other already well-documented anomalies. This chapter gives key theoretical concepts for understanding the differences and similarities between seasonal regularities.

3.2 January Effect

The January effect or turn-of-the-year effect is the first anomaly described in this section. January effect is arguably one of the better-known stock market anomalies discovered during the past decades. Many explanations for it exist, commonly three known reasons are provided. These reasons are tax-loss-selling-hypothesis, information hypothesis and the-turn-of-the-month liquidity hypothesis [Brown, Kleidon & Marsh, (1983)].

Rozeff and Kinney (1976) brought the January effect to the attention of modern finance. However, the January effect was first introduced more than 60 years ago by Wachtel (1942). The year-end changes in stock prices are known as January effect. According to efficient market hypothesis, if an anomaly is exploitable one would expect that opportunity would be priced away. However, evidence indicates that the January effect is still going strong over 20 years after its discovery. Many studies show that stock returns are on average higher in January compared to the other months. This market reaction has made researchers to conclude reasons for investors not to start benefiting from this market friction.

The January effect is usually much stronger for small market capitalization stocks and thus, it should be investigated with size effect (Keim, 1983). Size effect itself is a very well known market anomaly implying that small stocks deliver higher returns on average than large stocks. The small-capitalized stocks usually experience much higher volatility than large-capitalized stocks. As a result, the likelihood of receiving negative returns is higher and thus small-capitalized stocks are better sell candidates at the year end. This is because of the fact that in order to minimize the taxes paid on capital gains, investors usually sell the stocks that have plunged from the date of purchase and keep the stocks that have performed well. Capital losses can be used to decrease taxable income, because of the taxes are determined after netting capital gains and losses. The sale of the worse performing stocks is usually done just before the tax year-end. The January Effect occurs because many investors choose to sell some of their stock right before the end of the year in order to claim a capital loss for tax purposes. Once the tax calendar rolls over to a new year on January these same investors quickly reinvest their money in the market, causing stock prices to rise.

Berglund (1996) evidence the January effect in Finland. Berglund finds that Finnish monthly seasonals are very similar to those observed on other exchanges in the world. The main difference to international evidence is that January effect is for both small- and large-capitalized stocks. Closer look at daily returns in January clearly shows that a large part of the reported January effect is actually built up during the first four trading days of the year.

3.2.1 Reasons for January Effect

Explanations offered for seasonal characteristics of stock prices include tax factors, omitted or seasonal risk considerations, institutional factors, insider trading activity, seasonal trading by individuals or institutions, nonsynchronous trading and information effects. Also pre-test bias, biased data, mismatch between calendar and trading time, dividend effect, manifestation of other calendar effects and small firm effect. However, usually three prominent reasons for the January effect are suggested. Researchers often claim that tax-loss-selling hypothesis, information hypothesis and turn-of-the-month liquidity hypothesis drive the January effect.

Tax-loss-selling hypothesis implies that investors want to decrease their taxes paid on capital gains by selling stocks that have made loss. Tax-Loss-Selling (TLS) hypothesis is closely related to the size effects according to Keim (1983). The size effect implies that small firms tend to deliver higher returns because these stocks tend to be more volatile. Because greater variability in stock prices, there is greater change in small-capitalized firm to make losses and this makes them potential sell candidates in the year-end. After the tax-year end the selling pressure disappears and the prices are moved back to equilibrium levels.

Tax-loss-selling hypothesis has been tested in numerous different markets. Chen and Singal (2001) reported evidence that supports tax-related selling hypothesis as a driver for January effect. Kato and Schallheim (1985) tested the effect with Japanese data. Kato and Schallheim (1985) considered Japanese stock market as an interesting opportunity to test the tax-loss-selling hypothesis. First in Japan there are no taxes on capital gains. Second each firm can choose its fiscal year in their own discretion. They conclude that January effect and size-effects are similar to those of the US despite the fact that Japanese tax regimes and fiscal year end differs from those in the US. These facts can be considered to dilute the explanatory value of tax-loss-selling hypothesis.

Brown, Kleidon and Marsh (1983) tested the tax-loss-selling hypothesis with Australian stock returns. They find out that December, January, July and August have significantly higher raw returns than the other months. The small firm premium is similar in every month. In the US the size-effect is found only in January. Brown, Kleidon and Marsh (1983) conclude that the tax-loss-selling hypothesis is not consistent with the Australian evidence.

Berges, McConnell and Schlarbaum (1984) tested whether the tax-loss-selling hypothesis could explain the January effect in the Canadian stock market. They focused on year 1972, because then Canada changed its tax regime and set taxes on capital gains. Prior to that there were no taxes on capital gains and thus, January effect should not exist. However, they find that the January effect is similar to the US both prior and after 1972.

In Finland, the shareholders who pay taxes according to Finnish tax laws are compensated by the amount of corporate tax the companies have paid on profits distributed as dividends. Because of this tax treatment, the Finnish shareholders should indifferent between earning dividends and capital gains. However, the foreign investors are not entitled to this kind of compensation and might decide to sell their stocks before the dividends in order to avoid double taxation.

Other possible reasons for the phenomenon have also been investigated mainly because of the obvious inconsistencies in evidence on tax-loss-selling hypothesis.

The second commonly known theory explaining the January effect is the information hypothesis. Brown, Kleidon, Marsh (1983) argue that at least for those firms with year-end fiscal closing, January is a month of increased uncertainty and anticipation due to the impending releases of important information. This argument strengthens especially the small-capitalized stocks relation to the phenomenon. Small firms publish less frequently their financial statements and they are less tracked by analysts and therefore, the new information is released with the fiscal year closures. Risk-return relationship, widely accepted in modern finance, acclaims that higher risk lead to higher returns. This supports the evidence of higher returns in January.

Barry and Brown (1984) tested the information hypothesis as a possible explanation of the small firm effect. They find that information hypothesis explains at least some of the small firm effect.

Turn-of-the-month liquidity hypothesis is the final explanation for the January effect explained in more detailed manner here. The liquid profits are often used to explain the turn-of-the-month anomaly. They can, however, also explain the January effect since the liquid profits are assumed to be the greatest at the end of December.

The liquid profits are generated as a consequence of the seasonal patterns in cash flows. The year-end is usually the time for realizing profits from privately owned businesses and year-end salary bonuses and thus, the liquid profits of investors are the highest. Basically, the individual investors generally realize larger year-end profits than institutional investors. This finding is in line with small company stocks usually showing a stronger January effect than large stocks, because the small stocks tend to be held by individual investors and large stocks proportionately more by institutional investors. Odgen (1990)

Turn-of-the-month hypothesis implies that liquid profits are the highest at the end of December. Odgen (1990) finds three reasons supporting this hypothesis: first he states that the excess returns in January concentrate around the first few trading days. Secondly, Odgen (1990) finds out that it is reasonable to suppose that the liquid profits are greater in December compared to the other months. Thirdly, he argues that January effect is clearly larger for small firms. This is because individual investors hold proportionately more small firm stocks than institutions in the US.

In general the liquid profits are dependent on aggregate liquidity of the economy according to Odgen (1990). This could be interpreted that in Decembers of stringent monetary policy, the January returns will be lower and in Decembers of easy monetary police the January returns will be higher.

3.3 Day- of- the- Week Effect

The day-of-the-week effect, also known as weekend effect implies that returns are dependent on the day of the week. Most authors report that the day-of-the-week effect consists in a

negative equity return on Monday and/or Tuesday, depending on the marketplace, and an abnormal high return on the last trading day of the week. I will explain the main findings of this anomaly and turn-of-the-month as well quite thoroughly, because it gives better understanding for reasons behind the holiday effect. It will also useful when the independence of the holiday effect is tested.

French (1980) write the pioneering article of the weekend effect in US equity market. French notes the article of Clark (1973), in which the negative return on Mondays was first recognized. Since then, several studies indicate negative Monday returns on US equity markets (Ziemba, 1994). Additionally, Wang, Li and Erikson (1997) find that the Monday effect occurs primarily in the last two weeks of the month.

Evidence from other major markets provides further support for existence of the weekend effect. Paudyal and Draper (2003) evidence that negative average Monday returns are found in UK stock market. Similarly, Frantzmann (1989) and Chang et al. (1993) report the effect on the German stock market. However, Frantzmann (1989) also find that negative returns are not only limited to Mondays but occur also on Tuesdays. Findings in smaller equity markets in Europe support the view of negative Tuesdays. Martikainen and Puttonen (1996) observed evidence of negative Tuesdays in the Finnish stock market. Other findings in smaller equity markets in Europe appear to support the view of negative Tuesdays, e.g. Spain by Santamases, 1986; Sweden by Claesson, 1987; Belgium by Corhay, 1990; Italy by Barone, 1990; France by Solnik and Bousquet, 1990; and Ireland by Lucey, 1994. Jaffe and Westerfield (1985) observed the Tuesday phenomenon also in the Australian and Japanese stock markets. In addition to Japan, negative Tuesdays are also documented in Korea (see e.g. Hiraki and Maberly (2000)). Latest study from Finnish markets show significantly negative stock returns on Wednesdays (Wikstrom, 2002).

Many reasons are given as explanation for returns observed on different days in different markets. One of the given explanations is information asymmetry between the US, Europe and Asian markets. The logic behind this is that Asian markets are one day and Europe half a day ahead of New York and low Monday returns in US markets are reflected in prices in other time zones on Tuesdays because of the lag. This implies that weekend effect is US driven phenomenon. However, Jaffe and Westerfield (1985) conclude that the day-of-the-week effect is world-wide phenomenon and not just a result of some institutional

arrangement in the US. Hiraki and Maberly (2000) examine the relation between US Monday and Japanese Tuesday effect. They found no evidence in support of the relationship. They suggest that potential explanations rely on the microstructure properties unique to marketplace. Neither does the existence of Monday effect on the Israeli and UK market (see Lauterbach and Ungar, (1992)) support the theory. Martikainen and Puttonen (1996) hypothesize that low trading volumes and short-selling restrictions in many thin European markets contribute to the delay in the effect.

According to Ziemba (1993) the day-of-the-week variation is higher for small-capitalized than for large-capitalized firms, because of the larger bid-ask spreads and thin trading in these generally low priced securities. Small-capitalized firms are usually not as frequently tracked by analysts than large-capital firms. Ziemba also argues that individual investor's stake in small-capitalized firms is in most cases higher than in large-capitalized firms, which leads to variability in stock prices especially on Mondays, when individual investors proceed with their transactions after the weekend of financial planning.

Agrawal and Tandon (1994) report that the variance of the stock returns is highest on Mondays and lowest on Fridays. Foster and Viswanathan (1990) present that stock return variances are the highest on Mondays and keep decreasing toward Fridays.

3.3.1 Reasons for day-of-the-week effect

The most probable explanation for weekend effect is so called Miller's hypothesis. Miller (1988) suggests that the effect may be due to an increase in self-initiated sell orders[2]. During the weekend, investors, particularly individual investors have more time to review their financial decisions. Thus, sell orders are more likely to dominate markets early in the week. Institutional investor, on the other hand use often Mondays for strategic planning, thus they do not transact with the same propensity on Mondays as on other days. Martikainen and Puttonen (1996) find similar accumulation of sell orders on the Finnish market. They also show that investors tend to be more pessimistic early in the week by observing lower call/put ratios in derivative markets. Miller's hypothesis is further support by Lakonishok and

[2] Self-initiated sell orders refers to sell decisions that individual investors have made during the weekend by taken into account the publicly available information.

Maberly (1990) who support the view that low Monday returns are a result of high individual trading activity and low institutional participation on Mondays.

Second possible explanation is from French (1980). He argues that companies tend to release their bad news at the end of the week in order to give investors time to adapt to the new information. However, French admits that this cannot be the reason for constant negative Monday returns because investors would incorporate their expectations of bad news to stock prices during the week.

Thirdly, Penman (1987) and Damodaran (1989) find evidence for bad news flow effect. Bad news flow effect suggests that bad news, in particular, are released by the companies after the closing bell on Friday. This helps to explain the negative Monday returns. Athanassakos and Robinson (1994) maintain that the day-of-the-week effect is mainly due to news flow, especially of macroeconomic announcements. Interestingly, Finnish data is employed by Niemelä (2004) who studies whether macroeconomic statistics published in US can explain the day-of-the-week effect in Finnish stock market. The results were mixed, abnormally high Friday returns can be explained to some extent, but microeconomic news has no relation for negative Wednesday returns.

Lastly, one prominent reason is ex-dividend day hypothesis. Paydual and Draper (2003) argue that 94 percent of ex-dividend days in the UK are Mondays. They claim that this alone is sufficient to depress stock prices on Mondays. Athanassakos and Robinson (1994) examine the impact of clustering ex-dividend date on Mondays but even after correcting for this effect a strong negative Monday effect is observed in Canada.

Some other explanations for day-of-the-week effect include, e.g. bid-ask spreads, account periods and other reason relating to market microstructure. One of the more interesting explanations for the effect includes two different time hypotheses: calendar time hypothesis and trading time hypothesis. Calendar time hypothesis implies that returns are continuously compounded across all days. Then also Saturday and Sunday are taken into account, when calculating returns for Monday. Thus, Monday returns should be three times higher than on other days. Actual trading time hypothesis, on the other hand, assumes that the expected stock returns are equal on all weekdays. French (1980)

Figure 1

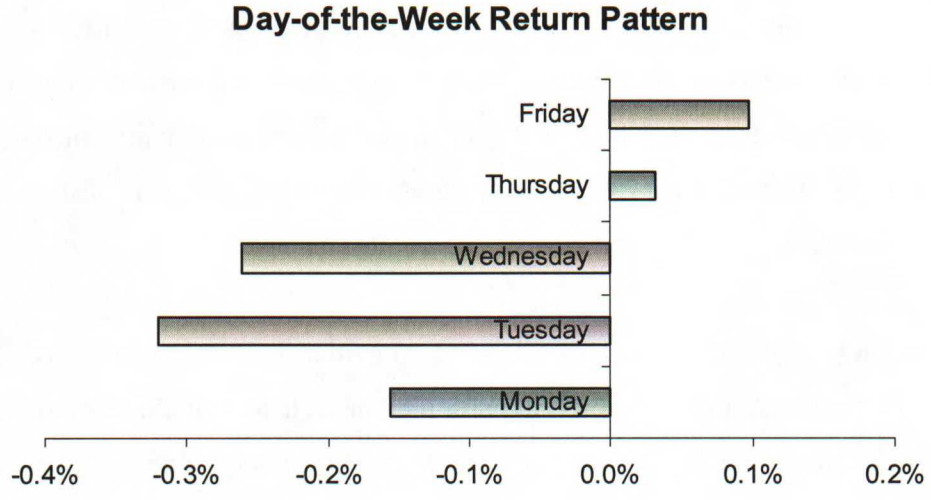


Figure 1 presents the finding of the day-of-the-week test in Finnish stock market by Martikainen and Puttonen (1996). Negative Monday returns are not observed as significant but negative Tuesday and Wednesdays are evident.

Stock return anomalies have also been tried explain by capital asset pricing models. Tinic and West (1984) reported strong seasonal pattern in estimates of risk premia from Capital Asset Pricing Model (CAPM). Similar results were discovered in study made by Gultekin, M and Gultekin, B. (1987) for Arbitrage Pricing Theory (APT) model. This seasonal pattern in stock returns is very interesting and various explanations have been offered to explain seasonal characteristics of stock prices. Explanations include tax factors, omitted or seasonal risk considerations, institutional factors, insider trading activity, seasonal trading by individuals or institutions, non-synchronous trading and information effects (Peterson 1990).

3.4 Turn- of- the- Month Effect

The turn-of-the-month effect implies that stock returns are on average higher around the turn-of-the-month. More precisely, the stock returns are significantly higher during the last trading day of the month. Ariel (1987) shows very convincing evidence that all of the cumulative return on stock index[3] examined for the period from 1963 to 1981 is realized on ten

consecutive trading days of the calendar month, beginning from the last trading day of the month and extending through the first nine trading days of the following month (-1 to +9).

Lakonishok and Smidt (1988) show that stocks earned significantly higher returns on turn-of-the-month days than on other days in the USA. They define turn-of-the month as the last trading and the first three trading days of the month. They reported that on average the cumulative returns over this four-day period from the last trading day of the month to the third trading day of the following month (-1 to +3) exceed the cumulative return for the rest of the month when the December/January turn-of-the-year period is excluded. They used the Dow Jones Industrial Average index of the period from 1897 to 1986.

These calendar anomalies were initially documented in the US, but have subsequently been studied internationally. Cadsby (1989) obtains similar results for Canada. Ziemba (1989) provides evidence of a turn-of-moth effect in Japan that runs over the last five and first two trading days of the month. More recently, Agrawal and Tandon (1994) investigate eighteen non-US countries: ten European countries (Belgium, Denmark, France, Germany, Italy, Luxemburg, Netherlands, Sweden, Switzerland and the UK), three Asian countries (Hong Kong, Japan and Singapore) and two Latin American countries (Brazil and Mexico). They report that in ten out of eighteen countries the findings were similar to those of Lakonishok and Smidt. Results reported in ten countries showed that the cumulative returns over the four-day period, (-1 to +3), around the-turn-of-the-month were significantly higher than on average four-day period. In six countries, over 70% of the average return for an entire month was accumulated over a five-day or shorter period around the turn-of-the-month. In addition, they find an interesting fact that the last day of the month had a very low variance compared to other days.

Martikainen, Perttunen and Ziemba (1994) investigated the continuity of turn-of-the-month effect in 24 stock markets and 12 different regional indices in the world using a sample period from January 1988 to January 1990. They report that turn-of-the-month effect exist for most countries as well as regions. However, they conclude that in the small stock markets, such as Mexico, New Zealand, Australia and Finland the turn-of-the-month effect seemed not to exist. A lot of debate of the reasons, why the-turn-of-the-month effect was not found from

[3] Ariel (1987) studied the University of Chicago's Center for Research in Securities Prices (CRSP) equally weighted and value weighted daily stock index returns in order to proxy the returns accruing to US securities.

Finnish stock market, did take place. Martikainen (1999) reported three reasons for this: first, the sample period from 1988 to 1990 was very short; second the index under investigation included only a small number of shares, which were not very actively traded and third, the event window of the study was constructed from the last trading day of the month to the first four trading days of the next month, (-1, +4). The five-day event window was argued to be too short.

Later, Martikainen, Perttunen and Puttonen (1995) investigated the turn-of-the-month effect again with Finnish stock market data using a longer sample period. This time, their data consisted of daily observations from May 2 1988 to October 14 1993. The turn-of-the-month period was defined to consist of ten consecutive trading days, i.e. (-5, +5). The conclusion was that the turn-of-the-month effect is found in Finnish stock market as well as in futures and index option markets.

Another monthly effect is the half-month effect where the mean daily return of the first half of the trading month is significantly higher than the mean daily return of the last half of the trading month. Here, the first half of the trading month extends from last trading day of the previous month to the first eight trading days of the month, a total of nine trading days, while the last half of the trading month consists of nine trading days before the last trading day of the month. In fact, Ariel (1987) first examined this half-month effect.

Jaffe and Westerfield (1989) extended the study to Japan, Canada, Australia and United Kingdom. They used data over different time periods until the mid-1980s. They found that Australia exhibited such half-month effect while Japan had a reverse half-moth effect, in that the mean daily return for the first half of the month was significantly less than that for the last half of the month. However, no half-month effect was found from Canada and United Kingdom.

Liano, et. al. (1992) examined the impact of economic cycles on the half-month effect in over-the-counter (OTC) stock during the period 1973-1989. They concluded that the economic cycles were found to have an impact in that the half-month effect only existed in the periods of economic expansion but not during periods of economic contraction.

Wong (1995) further extended half-month effect research by studying five developing stock markets of Hong Kong, Taiwan, Thailand, Malaysia and Singapore by using the leading stock market indices in these countries over the period 1975-1989. The time horizon was divided to three periods, 1975-1979, 1980-1984 and 1985-1989, in the study. The results showed that the half-month effect hardly existed in these emerging markets. The effect was not found in Singapore, Malaysia, Hong Kong and Taiwan. Thailand exhibited a reverse half-month effect in the second time period but no half-month effect was found in the first and third periods.

Boudreaux (1995) investigates the half-month effect in the stock markets of seven markets of seven countries, Denmark, France, Germany, Norway, Singapore/Malaysia, Spain and Switzerland during periods 1978-1992. Significant half-month effect was found in three countries, Denmark, Germany and Norway while a significantly inverted half-month effect was discovered in Singapore/Malaysia. The half-month effect was still significant even with January observations removed. Thus, the existence of the half-month effect could not be explained by the January effect.

Studies in even more exotic countries have been carried out. Balaban and Bulu (1996) examine Istanbul Securities Exchange Composite Index between 1988 to June 1995. Half-month effect in Turkey did not exist except in 1994. However, Mills, et. al. (2000) find a half-month effect in Greece by using data on the General Index of the Athens Stock Exchange and 60 constituent stocks over the period from October 1986 to April 1997.

Quite recently, a third monthly effect called the time-of-the-month effect or the third-month effect, has been identified by Kohers and Patel (1999). Kohers and Patel divided calendar month into three segments. The first segment extends from the 28th day of the previous month to the 7th day of the month, the second segment extends from 8th day to the 17th day of the month and the last segment consist of the other days, that is, the 18th day to the 27th day of the month. They showed by using the Standard & Poor's index during the period January 1960 – June 1995 and the NASDAQ index during the period January 1972 – June 1995, that the returns were highest during the first third of the month while the returns in the last third of the month were the lowest and mostly negative.

Lian, K.K. (2000) examines these all three types of monthly effect in the six Asia-Pacific stock markets of the US, Japan, Hong Kong, Australia, Malaysia and Singapore using data from 1970s until the 1990s. He results that the turn-of-the-month effect is the most prevalent phenomenon of the three types of monthly effects considered. This effect appeared in Australia, Hong Kong, Japan and in recent years in Malaysia as well. The half-month effect was considered to be very weak, the effect completely disappeared in all six countries in the 1990s. Lian (2000) concluded that the effect observed by Ariel (1987) in the US was probably a 1960s phenomenon. For the final effect Lian (2000) concludes that the third-month effect documented by Kohers and Patel (1999) is a recent US phenomenon only. The other five countries under review do not have such a phenomenon.

3.4.1 Reasons for turn-of-the-month effect

The explanations to the turn-of-the-month effect originate seasonal patterns of cash flows as well as companies' practice to announce good and bad news in certain points in time (e.g. Penman, 1987 and Lakonishok & Smidt, 1988) Penman (1987) suggests that firms tend to announce good news during the first half of the month and bad news during the second half. This will lead to rise in stock returns in the turn-of-the-month. The explanations are closely related to reasons presented in connection with January effect. High January returns are concentrated around the turn-of-the-month, which strongly supports the turn-of-the-month effect.

Lakonishok & Smidt (1988) attribute the turn-of-the-month pattern to seasonalities in cash flows of individuals and institutions. They argue that for major economic entities the turn of each calendar month is a typical payment date for accrued wages, dividends, interest and principal payments. As a result, when these entities have short-term investable funds, they prefer to invest the balance in securities maturing at the end of the month.

Odgen (1990) shows the same idea as Lakonishok & Smidt (1988) with individual investor. As mentioned before, Lakonishok & Smidt (1988) based their theories on major economic entities. Odgen (1990) assumes that the bulk of expected monthly cash income for the representative investor is received in the turn-of-the-month, while expected cash expenditures are distributed uniformly through out the month.

Elton and Gruber (1974) introduce principles of working capital management. Based on this, it is assumed that the representative investor maintains a "layering" of liquidity in his or her investment portfolio. This implies that the investor allocates fixed proportions of investable funds to cash, highly liquidate securities such as treasury bills and to less liquidate investments such as stocks. To reduce transaction costs the investor will add stocks to his portfolio only if accumulated cash is sufficient to enable further investments in stocks. The cash position of the representative investors is the highest during the-turn-of-the-month. According to Odgen (1990) the high cash position will increase the demand for stocks and thus, prices will start to rise. Even more, Odgen (1990) argues that monetary policy may have an important effect on stock returns. As the monetary policy affects the growth of the liquidity in the economy, the policy is likely to affect expected liquid profits, which in turn affects the turn-of-the-month stock returns. Due to this, an easy (stringent) monetary policy in a given month is expected to lead to higher (lower) stock returns at the turn-of-the-month. Odgen (1990) investigated the effects of monetary policy on turn-of-the-month trading days and Fed funds spread. He concludes that stock returns on trading days in the turn-of-the-month are inversely related to stringency of monetary policy, and thus, support the turn-of-the-month hypothesis.

Turn-of-the-month effect and January effect are often considered as a same anomaly. Many times this is fine, but there are some factors (e.g. taxes) that need to be considered separately. One of the popular explanations still worth mentioning is window dressing. Window dressing is a strategy used by mutual fund and portfolio managers near the year or quarter end to improve the appearance of the portfolio/fund performance before presenting it to clients or shareholders. To window dress, the fund manager will sell stocks with large losses and purchase winner stocks near the end of the quarter. These securities are then reported as part of the fund's holdings.

3.5 Intraday Return Seasonalities

One of the more recent anomalies reported is intraday return seasonality. Harris (1986) finds a connection between the weekend effect and intradaily price patterns in US markets. Harris (1986) reports that the weekend effect tends to occur in the first 45 minutes of trading in Monday as prices fall, but on all other days prices rise during the first 45 minutes. However, on all weekdays prices rose significantly on the last transaction of the day. Harris (1986) was

first to discover the existence of the U-shaped pattern associated with the opening and closing of the trading session. Afterwards the same pattern has been identified in several studies in various markets. McInish and Wood (1990b) finds this pattern for NYSE, Brailsford (1995) for the Australian Stock Exchange, Cheung (1995) for the Hong Kong Stock Exchange, Pope and Yadav (1992) for the London Stock Exchange, Chang et. al. (1993) for the Tokyo Stock Exchange, McInish and Wood (1991) for the Toronto Stock Exchange and Bildik (2001) for the Istanbul Stock Exchange. Jain and John (1988) report that the U-shaped return pattern is not period-specific and persists over years on different market conditions. They conclude along with Harris (1986) that largest stock returns occur during the first and the last trading hours with the exception of Monday when the first hour produces negative returns.

Felixson (1998) studies intraday regularities in the Finnish stock market in the period from 1991 to 1995. He finds that the U-shaped pattern documented elsewhere exists in the Finland as well. Felixson (1998) concludes that the trading day can be divided into three clearly different periods in terms of returns: the beginning, middle and end of the day. High returns are found to last for up to an hour after the beginning of the continuous trading and again, during the last 30 minutes. In the middle of the day, prices remain somewhat constant.

Utriainen (2004) provides further evidence of the intraday seasonality in Finnish stock markets. Utriainen (2004) also confirmed the U-shaped pattern documented earlier in other studies. Returns are highest at and soon after the opening and just before the close of regular trading session. However, Utriainen (2004) notes that the magnitude of the effect is less robust early in the trading day than that suggested by Felixson (1998). Furthermore, not only are intraday returns observed to form a systematic pattern, Utriainen (2004) also states that volatility of returns follows U-shaped pattern. Highest volatility occurs early in the trading day.

Not only the returns observed form a systematic pattern. It is widely known that intraday trading volumes and return volatility vary regularly over the trading day. Foster and Wiswanathan (1993), and Brock and Kleidon (1992) identify U-shaped patterns in return volatility in the NYSE. In addition, they report a strong correlation between return volatility and trading volumes.

3.5.1 Reasons for Intraday Return Seasonalities

As other calendar seasonalities intraday effects are hard to explain within the efficient market framework. Several explanations have been presented but no single reason or factor can explain the phenomena. Theoretically the effect should vanish in time when investors start to trade against it.

Norden (1994) suggest that the market microstructure, particularly differences in trading mechanisms may have considerable impact on price patterns. For example, continuous vs. call mechanisms and specialists vs. non-specialists systems have been suggested to have different impact on price formation and information efficiency. Aitken, Brown and Walter (1995) note that the positive serial correlation in rates of return from the first ten or so trades on the NYSE may be attributed to the specialist system. However, regardless of different trading methods similar intraday patterns in many stock exchanges and markets have been observed. Thus, it is unlikely that they could provide a satisfying explanation to the anomaly.

Other microstructural issues have also been observed to affect the market behaviour. Harris (1986) attributes the U-shaped return pattern to biased closing prices. He maintains that the day-end effect is caused by an increase in the frequency of ask prices towards the end of the day. He suggests that an increase in prices is notably high on the last trade of the day. However, no explanations why buyers tend to be more active at the day-end are provided. Felixson and Pelli (1999) study the price manipulation in the Helsinki Exchanges. They provide evidence, although weak, of the possible day-end price manipulation by traders with large net positions. Hedvall (1994) reasons that traders with large net positions aim at improving their performance by artificially manipulating closing prices that are used as key benchmarks.

High returns immediately after opening is studied e.g. Pope and Yadav (1992). They find that good news tend to dominate bad news in the first hour of the day. Some other studied attribute them to price discovery and overnight returns in other markets. Felixson (1998) concludes that price discovery is particularly prominent in the Helsinki Exchanges, which is one of the first European exchanges to open for trading. As a result of early opening, no other European marketplace has immediate influence on share prices. This may lead to high bid-ask spreads and to somewhat volatile trading early in the day.

Investor psychology is also often given as an explanation for existence of anomalies. Technical analysts are considered as investors who attribute anomalies to investor psychology. In relation, Fabozzi et. al. (1994) document that equity prices exhibit reversals immediately following large intraday price movements. According to this, the price adjustment is a two-step process where immediate price reversals are followed by an eventual stabilization at some level. However, even the behavioural factors cannot explain the intraday regularities. Pope and Yadav (1992) find that futures and cash markets' return and volatility patterns diverge on intraday level. Thus, the difference must arise from other than psychological factors unless the two markets are somehow "behaviorally" segmented.

Finally, market conditions seem to have some affect on this intraday regularity. Aitken et. al. (1995) document that return patterns show more strength in favorable market conditions than in "bear market". Felixson (1998) agrees that in days with low returns, first arm of observed U-pattern partly disappears. However, market conditions do not have an effect on end-of-the-day anomaly.

3.6 Holiday Effect

A great number of studies document unusual patterns for stocks around holidays. Returns for trading days immediately before holiday (pre-holiday trading days) are unusually high regardless of weekday, month or year. Returns for trading days following holidays (post-holiday trading days) are more controversial. Some studies show that post-holiday returns are high only if they occur at the end of the week.

Due to this the pre-holiday anomalies have evolved over the years and most of the studies concentrate on the behavior of stock returns. The results of prior studies are somewhat the same. Abnormal pre-holiday returns on U.S. stocks have been documented by finance practioners for a long period of time. Pre-holiday strength has appeared since examination of the Dow Jones Industrial Average advances on days surrounding weekends by Fields (1934). Fields (1934) finds that during the period 1901 to 1932 frequency of advances on trading days preceding long holiday weekends fall disproportionately. Merrill (1965) finds disproportionate advances of the Dow Jones Industrial Average (DJIA) on the trading day

prior to the holidays for the period from 1897 to 1965. Again, Fosback (1976) reports high pre-holiday returns in the S&P 500 index.

Roll (1983a) finds high returns accruing to small firms on the trading day prior to New Year's Day. The pre-holiday effect is reported to exhibit the greatest strength and robustness among seasonal anomalies as evidenced by Lakonishok and Smidt (1988), who find that approximately 50 per cent of the capital gains of the Dow Jones Industrial Average (DJIA) occur on the ten pre-holiday trading days each year. They find that pre-holiday rate of return is 23 times larger than the regular daily rate of return. The percentage of positive rates of return before holidays is 63.9. Interestingly, they also conclude that although it is possible that the pre-holiday and pre-weekend returns have a common origin in the closing of the exchange the following day, the pre-holiday rates of return are generally two to five times larger than pre-weekend rates of return. Therefore, there appears to be an additional factor at work. Lakonishok & Smidt also denote that "prices also rise in all deciles (of market capitalization) on the last trading day before Christmas" and conclude that "the high Christmas returns of large companies might be considered (another) ...mystery." For post-holidays Lakonishok and Smidt (1988) report negative return for the total 90- year period. However, this rate of return is not significantly different from zero.

Ariel (1990) who reports that the average pre-holiday return, accruing to the Centre for Research in Security Prices (CSRP) equally and value weighted portfolios is nine to 14 times higher than the mean return on the remaining days. Ariel (1990) also reports that over one-third of the return accruing to the broad market over the 1963-1982 period is attributable to the eight trading days prior to holidays during each year. Ariel (1990) also carried out an extensive analysis whether high pre-holiday returns are caused by other calendar anomalies. The conclusion is that pre-holiday effect is not a manifestation of at least January effect, weekend effect or small firm effect.

Liano, *et. al.* (1992) found evidence of a pre-holiday effect in over-the-counter stock markets. Keim and Stambaugh (1984) showed that the return autocorrelation between non-trading period between Friday and Monday is highest pair of any successive days. More recently, Blandon (1995) reported strong return autocorrelations across non-trading periods not only for weekends but also for holidays. Nowadays, several studies evidence the existence of pre-holiday effect but a lot less evidence is for post-holiday effect. Menau and

Pardo (1992) have researched the existence of pre-holiday effect in Spanish Stock Exchange. Their results showed high abnormal returns on the trading day prior to holidays. They also stated the independence of the pre-holiday effect, i.e. it is not a manifestation of other calendar anomalies.

Therefore, there is a reason to believe that the pre-holiday effect, where higher stock returns are observed for days before holidays, is one of the largest seasonal regularities and considerable effort has been expended in an attempt to explain this anomaly. The above and other studies have attempted to account for the holiday effect by focusing on the three main explanations.

The first one suggests the possibility that the holiday anomaly may be just a manifestation of other calendar anomaly. Lakonishok and Smidt (1988), Ariel (1990) and Liano, *et. al.* (1992) were among the firsts to attempt to explain the holiday effect by appealing to other calendar anomalies such as day-of-the-week effect, the monthly effect and the turn-of-the-year effect. However, their results indicate that the high returns observed on the pre-holidays are not a manifestation of other calendar anomalies.

Cadsby and Ratner (1992) have studied pre-holiday effect with most international data. The data used in the study was 1980 to 1989 from 11 different stock indices from ten countries around the world. The results were mixed. Higher pre-holiday returns were observed in North-America, Asia and Pacific region. However, in Europe and United Kingdom no higher pre-holiday returns were observed. The findings are in contrast to those obtained to Menau and Pardo (1992) who found higher pre-holiday returns from European (Spanish) markets. According to Cadsby and Ratner (1992) it is possible that the pre-holiday effects are generated in one market, usually by US institutions, and spread throughout the world by investors trading and by the fact that markets often follow each other movements. Major holidays occur at the same time in all countries.

Other studies have also examined the relationship between pre-holiday effect and firm size. Pettengill (1989) reported that small firms outperform large ones both on January and non-January pre-holidays. On the contrary, Ariel (1990, 1623) reported that it is *"Not a Small Firm Effect"*. Ariel found that there are no incremental pre-holiday returns accruing to small firms after adjusting Day-of-the-week effect and excluding New Year's Day. Kim and Park

(1992) observed that the daily mean returns before holidays are much higher than in ordinary days for all size of firms. Their paper also found that even the returns were higher they were not by the same proportion. The daily mean return on pre-holidays for large companies was over three times higher compared to ordinary days, while small companies averaged 2.2 times higher return compared to ordinary days.

The last explanation of the pre-holiday effect is based on a set of different trading patterns. Ariel (1990, 1625) points out that pre-holiday return strength can be attributed to covering short positions. Short-sellers who desire to close risky short but not long positions prior holidays or, simply, to some clientele which preferentially buys or avoids selling on pre-holidays.

The last mentioned explanation is more studied in recent years. Ariel (1990) also further explores hourly intraday stock return patterns on trading days prior holidays. In addition to strong evidence of high pre-holiday accrued on CRSP index from the close of trading day on the second day prior to holidays to the close of trading on pre-holidays, Ariel (1990) reports in more detail the temporal pattern of return accumulation around holidays. For DJIA Ariel (1990) observes that high pre-holiday mean return accrues during several hours of the pre-holiday period. During pre-holidays stocks open significantly higher than the previous day's close and advance during much of the remaining trading day. Interestingly, in particular last hour returns are high and display disproportionate frequency of positive returns.

These results are in line with results of Utriainen (2004), although the focus in this study is on all trading days. Ariel (1990) also studied the overnight return of pre-holiday close to post-holiday opening. CRSP index returns are significantly positive over the holiday itself, however stocks seem to lose ground after the opening and show insignificance of the pre-holiday close to post-holiday close. Unusual high returns accrue during the night before the pre-holiday and during pre-holiday trading. In particular, high returns accrue during the last hour of trading and during the holiday closing itself. In contrast, the trading day following the holidays displays no period of unusual returns. While the pre-holiday returns start prior to openings on pre-holidays, stocks accrue also high returns during the last hour of trading; the last hour is being responsible for one-third of the total pre-holiday return. Ariel (1990) clearly shows that holiday strength is just that: high returns ending with the start of trading following holidays.

Sometimes these trading pattern explanations include bid-ask spreads as explanatory variables. Keim and Stambaugh (1984) hypothesize, test and reject the hypothesis that market makers transacting at the bid or ask price with disproportionate frequency at the market close on certain days of the week could induce low or high returns on those days. Ariel (1990) takes this view in count in relation to his results of high pre-holiday last-hour mean returns. He tests that whether this high mean pre-holiday return might be induced by disproportionate frequency of last transactions at the ask price. Ariel (1990) studies whether stocks close at the bid, ask or "between"[4] on pre-holidays. Ariel reports that no systematic shift from bid to ask prices is evidenced. Thus, Ariel concludes that bid-ask effects cannot be considered as an important contributor to the high pre-holiday returns.

There are two reasons for looking at the holiday effect in order to find further evidence on stock market calendar anomalies.

First, weekend effects and turn-of-the-year effects have been observed in a number of countries. It is possible that these effects are being generated independently within each of these countries. Alternatively, it is possible that they are being generated by US institutions alone and spread around the world throughout the world by US investors trading on foreign markets and by the fact that markets often follow each other's movements. Weekends and turn-of-the-months and years occur at the same time in all countries. Therefore, it is difficult to distinguish between these two possibilities. However, holidays occur at different times in different countries. If anomalies are generated by US institutions and then spread to other countries, we should expect to observe abnormally high returns on days before US holidays. If, on the other hand, countries are generating anomalies independently, we should expect see abnormally high on days before local holidays.

[4] Assuming that all "between" prices are half-way between bid and ask prices

Table 1.

Holiday Effect Evidence in the Stock Markets

Author(s)	*Data*	*Period*	*Higher returns observed pre-holiday*	*Higher returns observed post-holiday*
Fields (1934)	Dow Jones Industrial Average	1915-30	Y	-
Lakonishok & Smidt	Dow Jones Industrial Average	1897-1986	Y	N
Pettengill (1989)	NYSE Large Firm Index	1962-86	Y	N
	NYSE Small Firm Index		Y	Y
Ariel (1990)	CRSP value weighted index	1963-82	Y	N
	CRSP equally weighted index		Y	Y (N if New Year holiday omitted)
Liano, Marchland & Huang (1990)	NASDAQ value weighted & equally weighted indexes	1973-89	Y	N
Easton (1990)	Australian stock indexes			
	Sydney All Ordinaries	1958-80	Y	Y
	Melbourne All Ordinaries	1963-80	Y	Y
Cadsby & Ratner (1992)	Stock indices:			
	United States (2 indices)	1962-87	Y	-
	Canada	1975-87	Y	-
	Japan	1979-88	Y	-
	Australia	1980-89	Y	-
	Hong Kong	1980-89	Y	-
	United Kingdom	1983-88	N	-
	Italy	1980-80	N	-
	Switzerland	1980-89	N	-
	France	1980-89	N	-
	West Germany	1980-89	N	-
		1967-87	Y	N
Vos, Cheung & Bishop (1993)	New Zealand: Barclay's Share Price Index		Y	N
Wilson & Jones (1993)	Stock indexes on NYSE, AMEX & NASDAQ		Y	Y
Agrawal & Tandon (1994)	Stock Indexes – 18 countries	1971-87	Y: 11/18	-
Liano & White (1994)	S&P 500, NASDAQ Composite Indexes	1962-91	Y	-
Kim & Park (1994)	Stock Indexes on NYSE, AMEX & NASDAQ	1973-86	Y	N

Table 1. Reprinted from Johnson and Cheng (1999)

4 DATA

4.1 Data Description

The data for this study applies daily closing levels of the main list of the Helsinki Exchanges (HEX). The indices used in analyses are the HEX All Share Index and Portfolio Index from January 1991 to November 2003. The daily stock returns are computed as logarithmic price relatives. The returns are adjusted for cash dividends and stock splits. It is crucial to incorporate dividends in the analyses because, in addition to capital gains, the dividends are an important source of stockholders' income. All tests to be reported in the body of this study employ these daily stock index returns. Mean values on days surrounding holiday's area also examined. Also daily volume (number of transactions) and turnover is tested for difference. The volume data is from January 4 1993 to November 6 2003.

The Finnish stock market has changed dramatically in the last two decades, in the framework of the thorough process of modernization and globalization experienced by the Finnish financial system. Either the number of companies listed in the stock exchange, as the number of operations performed has increased dramatically. The HEX Portfolio Index is most widely used to measure the behavior of the Helsinki stock market. All-Share and Portfolio Indices reflect the price and total-return development of shares on the Main List. In the Portfolio Index, the weight of any company is limited to 10 percent of the total market capitalization of the index. The use of this data gives an overall view of the market.

Figure 2

Market Conditions on Helsinki Exchanges

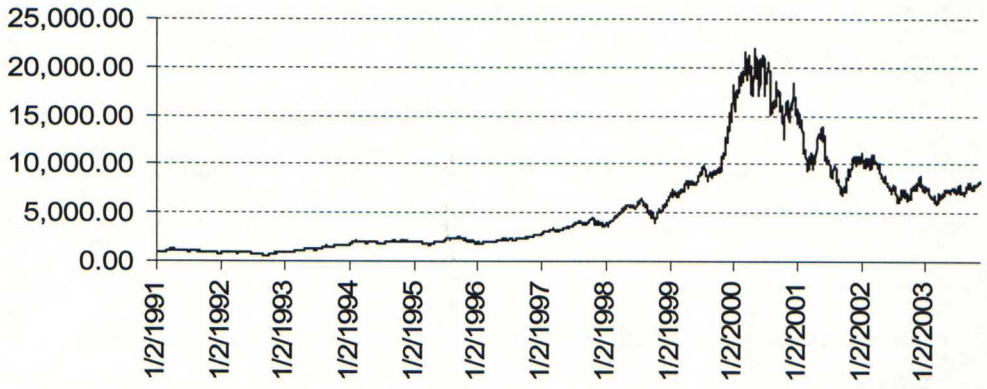


Figure 2 represents the market conditions on HEX from January 2 1991 to November 6 2003. The index shown is HEX All Share that includes all shares traded on HEX main list. HEX All Share index is market value weighted index.

Figure 3

Daily Turnover

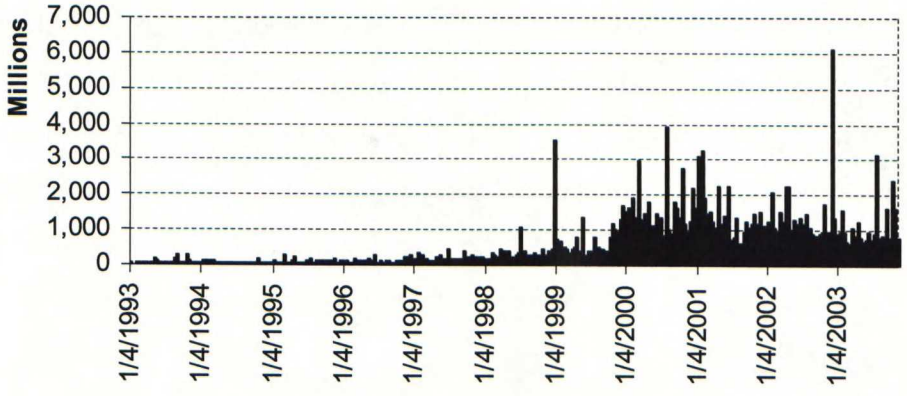


Figure 3 shows daily turnover of the HEX All Share Index from January 4 1993 to November 6 2003.

4.2 Definition of Holiday, Pre-Holiday, Post-Holiday and Non-Holiday periods

For the purposes of this study, a stock market holiday is defined as a public holiday on which the local stock market is closed because of the holiday. This definition follows the US studies by Pettengill (1989) and Ariel (1990).

The behavior of daily returns surrounding holiday closings is studied. Holiday closings are defined to include preannounced closings for the nine annual holidays observed by the Helsinki Exchanges.[5] Five out of the total nine holidays are traditional Finnish holidays when stock exchange is closed because of holiday in Finland but trading occurs in other countries. These five local public holidays are: *Twelfth Day*, *Ascension Day, May Day, Mid-summer Day* and *Independence Day.* Global holidays are *Christmas Eve, New Years Eve, Good Friday* and *Easter Monday,* respectively.

Holidays disproportionately fall on weekends. If any of these given holidays occurred on weekend it was excluded from the study and considered as a normal weekend. Fridays are counted as a day before a holiday if there is no trading on the following Monday.

The trading days in the sample period are divided into two categories; first categories for All Share and Portfolio index consist of pre-or post-holidays a day before/after holiday and days before/after holiday. On the first category only the one preceding day prior to holiday is considered as a pre-holiday $t_{[-1]}$. On the second category five preceding days prior to holiday are considered pre-holiday(s) $t_{[-1, -5]}$. Thus, the third and fourth categories are for analysis of the post-holiday trading days within same time interval after the holiday as in first and second category before holiday.

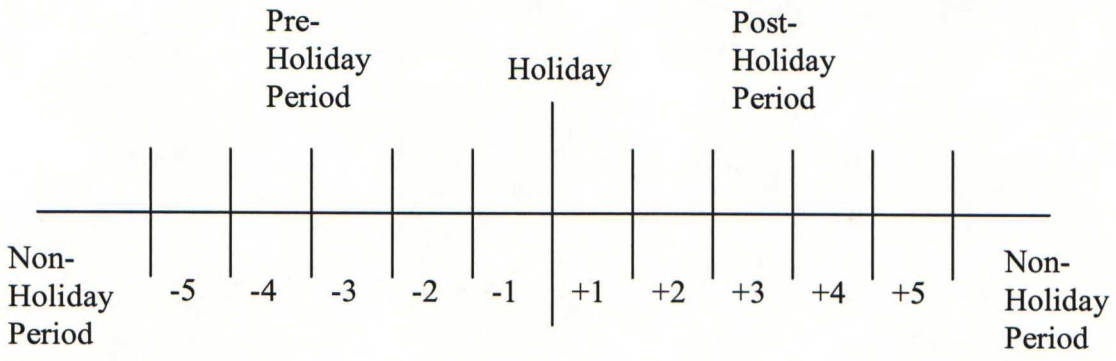
Between 1991-2003 the total number of trading days is 3216 is divided into two pre-holiday and two post-holiday subsets: the pre-holidays $t_{[-1]}$ have 90 observations and the pre-holidays $t_{[-1, -5]}$ have 354 observations and the ordinary days (non-holiday trading day excludes both pre- and post-holiday trading days; all ordinary days have 3036 and 2520 observations,

[5] The nine traditional holidays are: Twelfth Day, Good Friday, Easter Monday, Ascension Day, Labor Day, Midsummer Eve, Independence Day, Christmas Eve and New Year's Eve.

respectively). As for post-holidays, we get $t_{[+1]}$ 90 observations and for $t_{[+1,+5]}$ trading days 342 observations[6].

In some cases two holidays occur very closely to one another. If the time period between holidays is very short, less than five trading days, the pre-holiday trading days are considered from the first holiday and the post-holiday observations from the following. The trading days in between, one to four days, are considered as *inter-holiday* trading days. These make the time periods that are tested for holiday effect in the study's hypothesis.

Figure 4
Pre-holiday, Holiday and Post-holiday periods used in the study



4.3 U.S. Holiday Returns

This study tries to shed more light to a controversial holiday effect. The methods used in this tries to give more understanding to phenomenon to some extent. Usually the holidays under review have been global or US holidays, e.g. Christmas, New Years Eve, etc. However, this study uses national Finnish holidays as well as global holidays. During Finnish holidays the stock exchange is closed in Finland but open anywhere else. Evenly interesting is to study national U.S. holidays that are significant mainly to American people. To study whether U.S. holidays have any meaning for Finnish stock returns at certain dates when U.S. stock markets are closed due to holiday but open in Finland are also examined. Selected holidays are:

[6] The difference between observations for t(-1, -5) and t(+1, +5) is due to days preceding/following holidays fell unevenly on weekends.

Martin Luther King, Jr. Day, *Washington's Birthday (President's Day)*[7], *Memorial Day, Independence Day (4th of July), Labor Day,* and *Thanksgiving Day.* It is very interesting to see does pre- or post-holiday effect exist in Finland on local US holidays, or is the phenomenon driven by other factors. This part of the study is carried out with the same Finnish stock index data.

Table 2

The Number of Observations

1991-2003	Number of Days
Ordinary days	3216
Pre-Holidays $t_{[-1]}$	90
Post-Holidays $t_{[+1]}$	90
Finnish Pre-Holidays $t_{[-1]}$	53
Finnish Post-Holidays $t_{[+1]}$	53
U.S. Holidays	64
Ordinary Days	2520
Pre-Holidays $t_{[-1, -5]}$	354
Post-Holidays $t_{[+1, +5]}$	342

4.3 Data Mining

Many researchers using a variety of research procedures have documented anomalies in stock returns. Still, many of these findings are criticized as being only a product of data mining and that the results would not persist in the long-run. Skepticism about existence of these calendar or seasonal anomalies is based on a group of scientist arguing against possibility of

7 Although the third Monday in February has become popularly known as President's Day, the NYSE's designation of Washington's Birthday as an Exchange holiday (Rule 51) follows the form of the federal holiday outlined above (section 6103(a) of title 5 of the United States Code).

gaining excess returns by using trading rules based on previous stock returns. One of these skeptics is Fisher Black:

> Most of so-called anomalies that have plagued the literature on investments seem likely to be result of data mining. We have literally thousands of researchers looking for profit opportunities in securities. They are all looking at roughly same data. Once in a while, just by chance, a strategy will seem to have worked consistently in the past. The researcher who finds it writes it up, and we have a new anomaly. But it generally vanishes as soon as it's discovered (Black, 1993, 9)

We should be aware of the danger of the *data mining* or *data snooping*. Skepticism is usually based on characteristics that are common to almost all studies or at least interpretations of them. The common practice of applying the same data set to formulate and test hypothesis leads to data-mining biases that, if not taken into account, invalidate the assumptions underlying classical statistical inference (Sullivan, Timmermann & White, 2001). Lakonishok and Smidt (1988) called these considerations: boredom, noise and data snooping. They defined boredom as a relation to Merton's (1985) analysis of selection bias in studies reporting anomalies. According to Merton, even, if studies that fail to reject established doctrines are more numerous, they are less likely to be published because they support beliefs that are already widely held and hence do not add much new knowledge. Ross (1986) has also studied a similar form of selection bias. It is noted that many studies reporting anomalous findings might lead to a situation where reader overestimates the evidence of anomalies existence supported in the findings.

Fisher Black's (1986, 529-543) presidential address stressed the importance of noise in security returns. Anomalous changes in average rates of return are difficult to detect if there is a high level of nonstationarity in the return-generating process. Black also believes that it is common to underestimate the noise level, it is easy to report an anomaly when we have actually encountered only a noise.

Black's third consideration is called data mining or data snooping, it is the attempt to both discover and test the hypotheses using the same data. Statistical tests are usually interpreted as if they were applied to new data. Unfortunately, this rarely true in financial economics. There is a chance of finding statistically significant variables when a great number of researchers test a great number of different variables. It is not surprising that one eventually

finds variables with forecasting power.[8] However, this might work well within the sample, but will have no predictive power out-of-sample.

As a defense against data mining, the finance profession has developed a strong preference for empirical studies based on hypotheses derived from theory. This may provide protection to some extent but usually theories are revised or refined based on past studies and this way revised theories are tested using basically the same data set. Lo and MacKinlay (1990b) have studied data mining problem technically by specifying a-priori data mining strategies. They conclude that in general the forecastability found empirically, for various strategies, is greater than what can be explained by data mining only. The best remedy for data mining is new data. For example, using data sets of other countries and with more recent samples circumvent data mining problems.[9]

As for calendar anomalies, there seems to be striking evidence of systematic abnormal stock returns associated with e.g. January, day-of-the-week and holiday effect. Indeed, the finding of holiday effects is result of data mining. First study has been carried out in 1930. The results following these studies show that the holiday effect has remained at the same level or even increased while maintaining their statistical significance. These findings clearly violates the assumption that after the market anomaly comes into wide attention, it will vanish.

However, the persistence of the effects has also been tested. Sullivan, Timmermann &White (2001) investigated the calendar anomalies with over 100 years of daily data and with a new bootstrap procedure that allowed them to explicitly measure the distortions in statistical inference including data mining. They concluded that even though the nominal p-values for individual calendar effects are extremely significant, once evaluated with the whole universe from which the calendar rules where drawn. They also give recommendations for future studies and researchers: when evaluating a body of research it is important to assess the

[8] For example, Krueger and Kennedy (1990) show that if the winning team of American Super Bowl (held in January) is a team from the National Football League (rather than from the alternative American Football League), the US stock market will most probably rise that year. This indicator predicts the stock market direction more than 90% of the years correctly between 1967 and 1988!

[9] Because Finnish stock markets returns are highly correlated with the U.S. stock markets, it is likely that these datasets still suffer from the data mining problems.

results not by treating the individual studies as independent observations, but by explicitly accounting for they cross-dependencies.

5 HYPOTHESES

The prior studies have evidenced higher pre-holiday return. This aforementioned reasoning yield's several testable hypotheses. This study concentrates on mean returns and its frequencies whether these exists on pre-holiday. Also post-holiday mean returns are tested. The study hypothesis is that the stock indices mean return is equal on pre-holiday and post-holiday trading days than on ordinary days (non- holidays). Also the frequency of positive return days is tested to see does positive returns appear more often than expected. Finally, the equality of variances for the pre- and post- holiday trading days are tested to see whether risk characteristics are different. The volume and turnover hypothesis tests any differences from ordinary days means for these two variables.[10]

5.1 Equality of Returns

First the data is analyzed by calculating the averages and volatilities[11] of the pre- and post-holiday trading days and the ordinary days. These results are compared with each other. Some statistical averages is run to test the liability of the results i.e. are the averages in fact the same despite the differences in them.

The hypothesis 1 examines that pre- or post-holiday return should equal ordinary trading day return. If not, has the holiday effect on stock market return pattern. Hence the first hypothesis is:

Return:

$$H_{0(\mathrm{Return})} : r_{PHDay} = r_{Ord.Day}$$

[10] The hypotheses presented are applied for U.S. Holidays as well.

[11] Volatility, i.e. the standard deviation of certain parameter is respectively the square root of the variance. For additional information concerning the calculation of variance see e.g. Simon, Blume.

$$H_{1(Return)} : r_{PHDay} \neq r_{Ord.Day}$$

where

r_{PHDay} = pre - or post - holidays' average return

$r_{Ord.Day}$ = ordinary days' average return

5.2 Frequency of Positive Returns

Next the focus is turned into frequency of positive pre- and post-holiday returns. According to the hypothesis the average return is equal to ordinary day on pre- and post-holiday; we also expect that the frequency of positive returns is equal to ordinary days on pre- and post-holiday trading days.

Positive return frequencies on pre- and post-holidays are compared against ordinary trading days' positive return frequency. Return and positive return frequency should be equal.

The hypothesis 2 tests the frequency of positive returns on pre- and post-holidays. If the frequency is significantly higher on pre- or post-holiday trading days than on ordinary trading day null hypothesis is rejected. Hence the second hypothesis is:

Frequency:

$$H_{0(Frequency)} : \int_{PHDay} = \int_{Ord.Day}$$

$$H_{1(Frequency)} : \int_{PHDay} \neq \int_{Ord.Day}$$

where

$\int_{PHDay}$ = pre - or post - holidays' frequency of positive return

$\int_{Ord.Day}$ = ordinary days' frequency of positive return

5.3 Variances of Returns

In this hypothesis we are focused on the risk element of pre- and post-holiday trading days. According to EMH no extra element of risk should be included, so we expect the variances to be equal between holiday and ordinary days.

The hypothesis 3 tests the variances of the positive returns on pre- and post-holidays compared to variances of ordinary days. If the variance is significantly higher on positive return pre- or post-holiday trading days than on ordinary trading day null hypothesis is rejected.

Variance:

$$H_{0(Variance)} : \sigma^2{}_{PHDay} = \sigma^2{}_{Ord.Day}$$

$$H_{1(Variance)} : \sigma^2{}_{PHDay} \neq \sigma^2{}_{Ord.Day}$$

where

$\sigma^2{}_{PHDay}$ = pre - or post - holidays' variance of positive return

$\sigma^2{}_{Ord.Day}$ = ordinary days' variance of positive return

5.4 Equality of Volume

On our volume hypothesis we test differences in liquidity measure, share volume, i.e. the number of trades made on pre- or post-holidays compared to ordinary trading days.

The hypothesis 4 tests the equality of share volume on pre- and post-holidays compared to volumes of ordinary days. If the volume is significantly higher on pre- or post-holiday trading days than on ordinary trading day null hypothesis is rejected.

Volume:

$$H_{0(Volume)} : v_{PHDay} = v_{Ord.Day}$$

$$H_{1(Volume)} : v_{PHDay} \neq v_{Ord.Day}$$

where

v_{PHDay} = pre - or post - holidays' average return

$v_{Ord.Day}$ = ordinary days' average volume

5.5 Equality of Turnover

On our final hypothesis is on other liquidity measure, turnover, i.e. the value of shares traded in euros on pre- or post-holidays compared to ordinary trading day.

The hypothesis 5 tests the equality of share turnover on the pre- and post-holidays compared to turnovers of ordinary days. If the turnover is significantly higher on pre- or post-holiday trading days than on ordinary trading day null hypothesis is rejected.

Turnover:

$$H_{0(Turnover)} : \Omega_{PHDay} = \Omega_{Ord.Day}$$

$$H_{1(Turnover)} : \Omega_{PHDay} \neq \Omega_{Ord.Day}$$

where

Ω_{PHDay} = pre - or post - holidays' average turnover

$\Omega_{Ord.Day}$ = ordinary days' average turnover

This is the hypothetical framework of the study.

6 METHODOLOGY

The methodology employed in this study follows closely other studies on holiday effect. Pre- and post-holidays and other days (ordinary days) are compared by descriptive statistic methods to found possible differences. If differences are proved to occur, hypothesis presented previously are tested using a student's *t*-test statistic for differences of mean returns and a χ^2-test for the differences in frequency of positive returns. F-test is used to measure the equality of variances. Also nonparametric Wilcoxon Signed Rank- test for the equality of mean returns is used. Brown-Forsythe Modified Levene's test is also used to test the homogeneity of variances.

Calculating the means for pre- and post-holidays and means for ordinary days' to test the return differences. Two- tailed *t*-test is used to analyse the possible statistical difference. If return on pre- or post -holiday turns out to be different than on normal day, its dependency from frequency of positive return on pre-or post-holiday is tested. At last the variances of pre- and post-holiday returns are compared to ordinary days.

The daily stock returns R_t are computed as logarithmic price relatives given by:

(1) $$R_t = log\ (P_t / P_{t-1}) * 100\%$$

where:

P_t is the closing price of stock index at day t
P_{t-1} is the closing stock index at day t-1

For testing the pre- and post-holiday effect, the daily mean return of the pre-holiday day is the average of daily returns of the last trading day one day, $t_{[-1]}$ before the holiday. Post-holiday is naturally $t_{[+1]}$. In the case of return of pre-holidays $t_{[-1,-5]}$ and post-holidays $t_{[+1,+5]}$ the daily Abnormal Return (AR) is calculated and the Cumulative Abnormal Return (CAR) is analyzed between trading days t [-1 to –5] or t [+1 to +5].

The daily abnormal return AR_{ih} for index on holiday trading day is given by:

(2) $$AR_{ih} = R_{ih} - R_{io}$$

where:

R_{ih} is the average return for index on pre- or post-holiday

R_{io} is the average return for index on ordinary trading day

For analysis of the pre-holiday $t_{[-1,-5]}$ and post-holiday $t_{[+1,+5]}$ trading days cumulative abnormal return is used. Cumulative abnormal returns are given by:

(3) $$CAR_{iT1,T5} = \sum_{i=T1}^{T5} AR_{ih}$$

where:

T_1 and T_5 are either pre-holiday $t_{[-1,-5]}$ or post-holiday $t_{[+1,+5]}$ trading days

And from previous formula (4) we get the formula for cumulative average abnormal return. Cumulative average abnormal return:

(4) $$CAAR_{T1,T5} = \frac{\sum_{i=1}^{n} CAR_{iT1,T5}}{n}$$

where:

T_1 and T_5 are either pre-holiday $t_{[-1,-5]}$ or post-holiday $t_{[+1,+5]}$ trading days

6.1 Methodology to Test the Hypotheses

For the first hypothesis, the equality of returns is tested with student's *t*-test statistic.
t-test statistic is derived as follows:

(5) $$t=\frac{(\overline{R}_{ih}-\overline{R}_{io})}{\sqrt{\frac{\sigma^2{}_h}{n-1}+\frac{\sigma^2{}_o}{n-1}}} \sim t(n-1)$$

where:

$\overline{R}_{ih}$ is the average return on pre- or post-holiday

$\overline{R}_{io}$ is the average return on ordinary trading day

For the equality of returns, also nonparametric Wilcoxon Signed-Ranks test is applied.

W-statistic is obtained as the sum of the positive ranks:

(6) $$W=\sum_{i=1}^{n'} R_i(+)$$

where:

n'= sample size of *n* items

R_i= assign ranks for absolute difference from 1 to *n*'

(+)= items positive absolute difference

For second hypothesis concerning frequency of positive returns a Chi-Square statistic is given by:

(7) $$\chi^2=\sum_i\sum_j\frac{(f_{ij}-e_{ij})^2}{e_{ij}}\sim\chi^2(f)$$

where

$\sum_i$ = number of rows

$\sum_j$ = number of columns

f_{ij} = observed value

e_{ij} =expected value

The equality of variances is tested with F-statistic, given by:

(8) $$F=\frac{\sigma^2 L}{\sigma^2 S}$$

where

$\sigma^2 L$ is larger variance

$\sigma^2 S$ is smaller variance

In addition to F-statistic used by most authors, the homogeneity of variances is tested also by using Brown-Forsythe Modified Levene statistic, which is less sensitive to departures from normality. BFML-statistic is defined as:

(9) $$BFML=\frac{(N-k)\sum_{i=1}^{k} N_i(\overline{Z_i}-\overline{Z_{..}})^2}{(k-1)\sum_{i=1}^{k}\sum_{j=1}^{N}(Z_{ij}-\overline{Z_i})^2}$$

where:

N = sample size

k = number of N's sub-groups

N_i = the sample size of the ith sub-group

$\overline{Z}$ = group mean of the Z_{ij}

$\overline{Z}_{..}$ = overall mean of the Z_{ij}

Zij = $\left|\overline{Y_{ij}}-\overline{Y_i}\right|$

Y_{ij} = individual observation and $\overline{Y_i}$ is the mean of the ith subgroup.

To determine whether the holiday effect is independent of other reported calendar anomalies a following dummy variable regression model is estimated:

(10) $R_{it} = \alpha_i + \alpha_{i,1}D_1 + \alpha_{i,2}D_2 + ... + \alpha_{n,t}D_n + \varepsilon_{it}$

where:

R_{it}= close-to-close return for index i and day t

α_i = parameter estimates of expected mean stock return for each day

D = dummy variable, which equals one if the return occurs on the day before holiday and zero otherwise

ε_{it} = random disturbance term

7 RESULTS

The following paragraphs of the study will go through the findings of analysis carried out to test the holiday effect. The presentation of results is done against the aforementioned theories, also graphical descriptive statistics are provided.

7.1 High Pre-Holiday Returns

The 3216 trading days between January 2 1991 and November 6 2003 were divided into two pre-holiday subsets. First subset: the trading day prior to the holiday, t[-1], in the period (90 days), and ordinary days (3036 days). The five trading days prior to the holidays, t[-1,-5], in the period (354), and the rest 2520 days make up the second set. The means, medians and variances of the two stock indices for these two sets of pre-holidays and ordinary days (non-holidays) were calculated and are presented in Panel A of Table 3 (henceforth Table 3(A)). Also a *t*-statistic is reported for the difference of means.

The means of the pre-holiday returns exceed the means of the ordinary day returns. Table 3 (A) reports evidence of positive pre-holiday mean returns in Finland.

Table 3

Stock Return Behavior Around All Pre-Holidays t[-1]
Panel A: Means and Standard Deviations

1991-2003	All Share	Portfolio
Ordinary days		
Mean	**0.028 %**	**0.013 %**
Standard deviation	1.98 %	1.27 %
Median	0.051 %	0.043 %
Number of days	3036	3036
Pre-holiday		
Mean	**0.892 %**	**0.585 %**
Standard deviation	2.09 %	1.37 %
Median	0.600 %	0.576 %
Number of days	90	90
t-statistic (vs. Ordinary)[a]	*3.85*	*3.90*
Significant p-value	<0,0003	<0,0003
Wilcoxon test (*W*)[b]	3.02	2.45
Ratio of pre-holiday returns to ordinary days	32	45
Mean of all 3216 trading days	0.066 %	0.046 %
Standard deviation of all trading days	1.99 %	1.28 %

[a] Standard error used in deriving the *t*-statistic is calculated as:

$$\sqrt{\frac{\sigma^2_{holiday}}{89} + \frac{\sigma^2_{other}}{3035}}$$

For t[-1, -5] days the pre-holiday mean return exceeds the means of the non-pre-holiday returns. The mean return accrued on pre-holidays is shown on Table 3(B). On pre-holidays

[b] The reported test statistic is for nonparametric Wilcoxon test (*W*). The test is performed by comparing returns on pre-holidays with returns for ordinary days. This test, rather than the two-samples *t*-tests, is also used to test the differences in returns. For non-normal distributions, and especially for distributions containing outliers, the power of the Wilcoxon test is much greater than the power of the *t*-test. Moreover, under most distributional assumptions, the Wilcoxon test is more powerful than its parametric counterpart, and hence it is generally a much safer test to use. For discussion of this issue, see Conover (1980). (*W*) indicates significance at the 0.01 level (two-tailed test).

t[-1, -5] days the stocks mean returns show high returns averaging 36 to astonishing 122 times the mean returns for ordinary day.

Table 3 (B)
Stock Return Behavior Around All Pre-Holidays t[-1, -5]
Panel B: Means and Standard Deviations

1991-2003	All Share	Portfolio
Ordinary days excl. t (-1, -5) to t (+1, +5)		
Mean	**0.011 %**	**0.002 %**
Standard deviation	2.00%	1.28%
Median	0.052%	0.042%
Number of days	2520	2520
Pre-holiday t (-1, -5)		
Mean	**0.395 %**	**0.243%**
Standard deviation	1.93 %	1.25%
Median	0.287%	0.244%
Number of days	354	354
t-statistic (vs. Ordinary)[a]	*3.48*	*3.39*
Significant p-value	<0,0005	0,0008
Wilcoxon test (*W*)	3.85	3.93
Ratio of pre-holiday returns to ordinary days	36	122

7.1.1 Equality of Returns

Table 3(A) shows high mean returns on pre-holidays t[-1] for All Share index. The mean pre-holiday return is 0.89%, whereas on ordinary days it is 0.03%. For Portfolio index the pre-holiday mean is 0.59%, whereas on ordinary day it is 0.013%. On pre-holidays, stocks show high mean returns averaging 32 to 45 times the mean returns for the remaining days of the year. The corresponding *t*-statistics of 3.85 and 3.90 for the differences of these means show that the differences are statistically significant. The results show that for both indices average returns before holidays are significantly greater than for returns on days not before holidays. For All Share Index, the median return on pre-holiday trading days is 0.60% compared with

0.051% on days not before or after holidays. For Portfolio Index, the median return on pre-holiday trading days is 0.58%, compared with 0.043% on days not before or after holidays. The test for differences in means performed by comparing pre-holiday returns with returns on days not before or after holidays allows rejection of the null hypothesis of equality of returns at the 0.01 level for both indices.

Figure 5

Pre-Holiday Returns

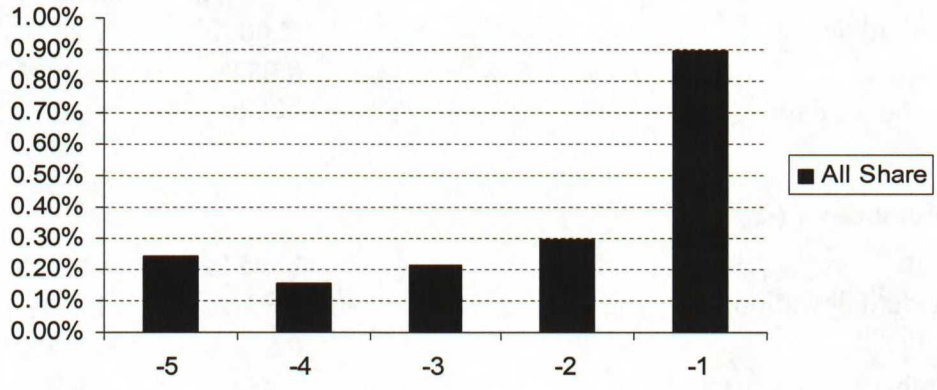


Figure 5. Mean returns on trading days preceding holidays. Histogram showing mean returns five days before holidays in the 1991-2003 period. Figures show high return only one day before holidays.

Although, all the five days preceding the holiday show positive returns, only the one preceding day, t[-1], shows statistical significance.

As discussed earlier, investigation of the U.S. stock market shows that the pre-holiday effect exists uniformly across all major markets and size-decile portfolios. As a result, we can observe that the pre-holiday effect is present in the Finnish stock market that has different holidays and institutional arrangements. The Table 3(A) shows that pre-holiday effect is even more pronounced for All Share index i.e. for stocks of large firms than small firms. The results of *t*-test exhibit that the difference of the mean returns between pre-holidays and ordinary days is statistically significant.

Table 4(A) Statistical characteristics of Pre-Holiday trading days

	Pre-Holiday t(-1) All Share	Pre-Holiday t(-1) Portfolio
Mean (%)	0.0089	0.0059
Median (%)	0.0060	0.0058
Std. Dev.	0.021	0.013
Kurtosis	4.78	5.87
Skewness	-0.37	-1.01
Minimum	-0.086	-0.061
Maximum	0.071	0.043
Count	90	90

As we can see the median return is also higher on pre-holidays than on ordinary days. In fact the median return is very high for both All Share and Portfolio indices. This result leads to reasoning that high pre-holiday mean returns reported in Table 3(A&B) could not be derived from small number of very high returns on pre-holidays. The median return is almost 13 times higher for both indices than on ordinary days. To examine this more, Panel A of Table 6 (henceforth Table 6(A)) reports the frequency of positive return days among the pre-holidays and ordinary days.

For post-holidays the results are fundamentally different. There is some evidence of positive mean returns after holidays. The average post-holiday return for All Share Index does not differ from ordinary day returns significantly. However, for Portfolio Index higher post-holiday mean returns are observed. Ariel (1985) and Pettengill (1989) both found evidence of positive mean returns after holidays for small companies but not for large companies. Pettengill (1989) used Standard & Poor's composite portfolio as an index of large companies, and an equally weighted index of all CRSP companies after deleting the 500 companies with the largest market capitalization at the beginning of each year as an index of small companies.

Next, the frequency of post-holiday returns is reported to further examine whether post-holiday effect exists. Results for the return analysis are reported in Table 5.

Table 5
Stock Return Behavior Around All Post-Holidays t[+1]
Panel A: Means and Standard Deviations

1991-2003	All Share	Portfolio
Ordinary days		
Mean	**0.028 %**	**0.013 %**
Standard deviation	1.98 %	1.27 %
Median	0.051 %	0.043 %
Number of days	3036	3036
Post-holiday		
Mean	**0.512 %**	**0.588 %**
Standard deviation	2.21 %	1.45 %
Median	0.381 %	0.386 %
Number of days	90	90
t-statistic (vs. Ordinary)	*2.04*	*3.71*
Significant p-value	0.044	<0,0003
Wilcoxon test (*W*)	1.49	2.87
Significant p-value	0.136	0.004
Ratio of post-holiday returns to ordinary days	18.3	45.2
Mean of all 3216 trading days	0.066 %	0.046 %
Standard deviation of all trading days	1.99 %	1.28 %

Table 5(A) shows high post-holiday returns for Portfolio Index. Post-holiday return for Portfolio Index exceeds the return for ordinary day by factor 45.

Table 5
Stock Return Behavior Around All Post-Holidays t[+1, +5]
Panel B: Means and Standard Deviations

1991-2003	All Share	Portfolio
Ordinary days excl. t(-1, -5) to t(+1, +5)		
Mean	**0.011 %**	**0.002 %**
Standard deviation	2.00 %	1.28 %
Median	0.052 %	0.042 %
Number of days	2520	2520
Post-holiday t (+1, +5)		
Mean	**0.138 %**	**0.160 %**
Standard deviation	2.05 %	1.34 %
Median	0.06 %	0.16 %
Number of days	342	342
t-statistic (vs. Ordinary)[a]	0.93	1.59
Significant p-value	0.35	0.11
Ratio of pre-holiday returns to ordinary days	12.5	80

As with pre-holiday trading days, table 5(B) shows that no statistically higher returns are observed on t[+1, +5] period.

Table 4(B) shows statistical characteristics of post-holiday trading days

	Post-Holiday All Share	Post-Holiday Portfolio
Mean (%)	0.0051	0.0059
Median (%)	0.0038	0.0037
Std. Dev.	0.022	0.014
Kurtosis	2.77	0.91
Skewness	0.88	0.65
Minimum	-0.045	-0.026
Maximum	0.098	0.051
Count	90	90

Figure 6

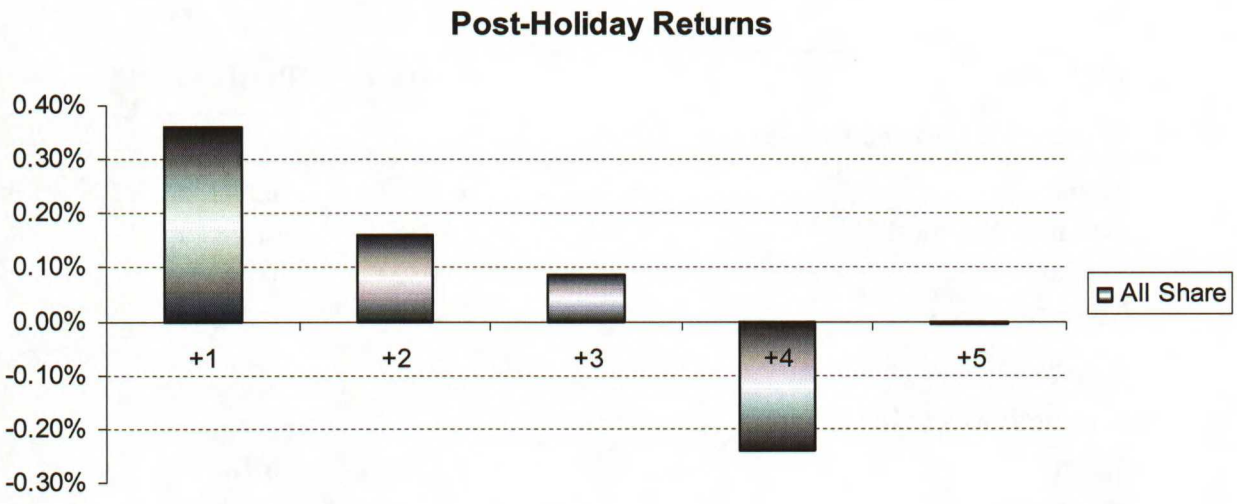


Figure 6 shows the return pattern for post-holiday trading days.

7.1.2 Equality of Positive Return Frequency

Table 6(A) reports χ^2-statistic testing the null hypothesis that the expected frequency of positive return days among pre-holidays equals the realized frequency of positive return days among all trading days in the period. In the first subset, the resulting test rejects the null hypothesis of equal positive return frequencies. In the second subset, however, the results are less statistically significant. We will talk more about this result in the following chapter[12].

[12] See paragraph 7.3 "Stock Returns on Days around Holidays"

Table 6
Stock Return Behavior Around All Pre-Holidays t[-1]
Panel A: Frequency of Advances

Panel A: The frequencies of positive return days among all trading days in 1991-November 2003 and among the pre-holidays in this period.

1991-2003	**All Share**
Positive return days among the 3216 days	1681
Fraction of positive days	**0.52**
Positive return days among 90 t(-1) pre-holidays	65
Fraction of positive days	***0.72***
χ^2-stastistic[d]	13.7
Significant p-value	<0.0002
Positive return days among the 2862 days	1476
Fraction of positive days	**0.52**
Positive return days among the 354 t(-1, -5)	205
Fraction of positive days	***0.58***
χ^2-stastistic	4.23
Significant p-value	0.039

In the Table 6(B) we can see very similar results as in Table 6(A) for Portfolio index. The χ^2-statistic shows significance on high level for t[-1] days, but is also significant for t[-1, -5] days at 0.05 level. It could be considered that the high pre-holiday mean returns reported in Table 3(A&B) do not derive from a small number of very high return pre-holidays. And as the frequency decreases on longer time span [t (-1, -5)] the high frequency of positive returns occurs just one day before holiday.

[d] Letting O signify the observed number of positive return pre-holidays and E signify the expected number of positive pre-holidays on the null hypothesis that the pre-holidays are random events from the sample, the χ^2-statistic is calculated as: $2(O - E)^2/E$. There are 65 or 205 observed positive return pre-holidays. The expected number of positive return days (0.52 %) times the 90 or 354 pre-holidays in the sample.

Table 6
Stock Return Behavior Around All Pre-Holidays t[-1]
Panel B: Frequency of Advances

1991-2003	**Portfolio**
Positive return days among the 3216 days	1681
Fraction of positive days	0.52
Positive return days among 90 t(-1) pre-holidays	65
Fraction of positive days	***0.72***
χ^2-stastistic	13.7
Significant p-value	<0.0002
Positive return days among the 2862 days	1476
Fraction of positive days	0.52
Positive return days among the 354 t(-1, -5)	204
Fraction of positive days	***0.58***
χ^2-stastistic	4.23
Significant p-value	0.039

In the Table 7(A) we can see that the frequency of positive post-holiday returns is not statistically significant for All Share Index. The χ^2-statistic shows low statistical significance for t[+1] days, but is also totally insignificant for t[+1, +5].

Table 7
Stock Return Behavior Around All Post-Holidays t[+1]
Panel A: Frequency of Advances

1991-2003	**All Share**
Positive return days among the 3216 days	1681
Fraction of positive days	0.52
Positive return days among 90 t(+1) post-holidays	54
Fraction of positive days	**0.60**
χ^2-stastistic	2.09
Significant p-value	**0.148**
Positive return days among the 2862 days	1476
Fraction of positive days	0.52
Positive return days among the 342 t(+1, +5)	182
Fraction of positive days	0.53
χ^2-stastistic	0.01
Significant p-value	0.92

In the Table 7(B) we can see results as in Table 7(A) for Portfolio index. The χ^2-statistic shows significance on high level for t[+1] days, but is fails to report significant results for t[+1, +5] days. As on Portfolio Index the value of any company is limited to maximum 10 percent, it could be considered as proxy for smaller firms. These findings are consistent with the evidence for small firms in the U.S. (Ariel 1985; Pettengill 1989) and also consistent with the Australian evidence of Ball and Bowers (1988). The frequency decreases, as it did with pre-holidays, on longer time span [t(+1, +5)] the high frequency of positive returns occurs just one day after holiday.

Table 7
Stock Return Behavior Around All Post-Holidays t[+1]
Panel B: Frequency of Advances

1991-2003	Portfolio
Positive return days among the 3216 days	1681
Fraction of positive days	0.52
Positive return days among 90 t(+1) post-holidays	59
Fraction of positive days	**0.66**
χ^2-stastistic	6.13
Significant p-value	**0.013**
Positive return days among the 2862 days	1476
Fraction of positive days	0.52
Positive return days among the 354 t(+1, +5)	185
Fraction of positive days	**0.54**
χ^2-stastistic	0.28
Significant p-value	0.59

7.1.3 Equality of Variances

Table 3(A) also shows that on pre-holidays the mean return is 0.45% and 0.46% of the standard deviation for the All Share- and Portfolio indices, respectively. This is surprising since the mean return earned by stocks is usually negligible compared to the variation in the return. On the Table 3(A) we can see that on the pre-holidays, the variance of return is no larger than the return variance for all other days, despite the much larger return generated on pre-holidays.

For t[-1, -5] pre-holidays the standard deviation of mean return is even lower than on ordinary days as shown on Table 3(B). This is surprising since the average return is usually comparable to the variation in the return. This fact as Ariel points out (1990) serves to emphasize that a possible pre-holiday return would not be a reward for bearing extra risk. Despite the much higher return, the pre-holiday variance of the return for All Share Index is slightly larger than the return variance for all other days i.e. means and variances do not

increase proportionately. If so, the pre-holiday mean return, which is 32 times higher than on ordinary day for $t_{[-1]}$ days resulted from 32 normal days somehow compounded into one day. For $t_{[-1, -5]}$ pre-holidays the mean return ratio to ordinary days is 36 to 122 times higher. Not only is the pre-holiday variance of return the same as the variance for ordinary days it is actually *lower* than variance of non-pre-holidays. This result is very similar reported earlier by Ariel (1990).

F-tests fail to reject the hypothesis of equal variances i.e. null hypothesis holds. Test results are reported on Table 8 Panel A. Also Brown-Forsythe Modified Levene's statistic (*BFML-statistic*) is reported to test the null hypothesis of equality of variances.

Table 8
Equality of Variances
Panel A

	Pre-holiday t[-1]	**Pre-holiday(s) t[-1, -5]**
	F-statistic	***F-statistic***
All Share	***1.06***	***1.04***
BFML-statistic	0.150	0.003
Portfolio	***1.08***	***1.02***
BFML-statistic	0.045	0.001

The critical F-statistic value for 0.05 confidence level is 1.27 and 1.14, respectively. BFML-statistic fails to reject the assumption of equal variances as well.

These results verify the fact that higher pre-holiday returns are not a reward for bearing extra risk.

Table 8(B) reports the variance test results for post-holidays trading days.

Table 8

Equality of Variances
Panel B

	Post-holiday t[+1]	Post-holiday t[+1, +5]
	F-statistic	*F-statistic*
All Share	***1.12***	***1.04***
BFML-statistic	2.119	2.793
Portfolio	***1.14***	***1.06***
BFML-statistic	3.016	0.541

The critical F-statistic value for 0.05 confidence level is 1.27 and 1.14, respectively. BFML-statistic fails to reject the assumption of equal variances as well.

These findings highlight mean and median returns for day before holidays. High returns predominate only on the single trading day preceding holidays and not on other days. Results are statistically significant for both All Share and Portfolio Index. The high returns before holidays are only observed one day before holiday, i.e. strong pre-holiday effect exists in the Finnish stock market.

Figure 7

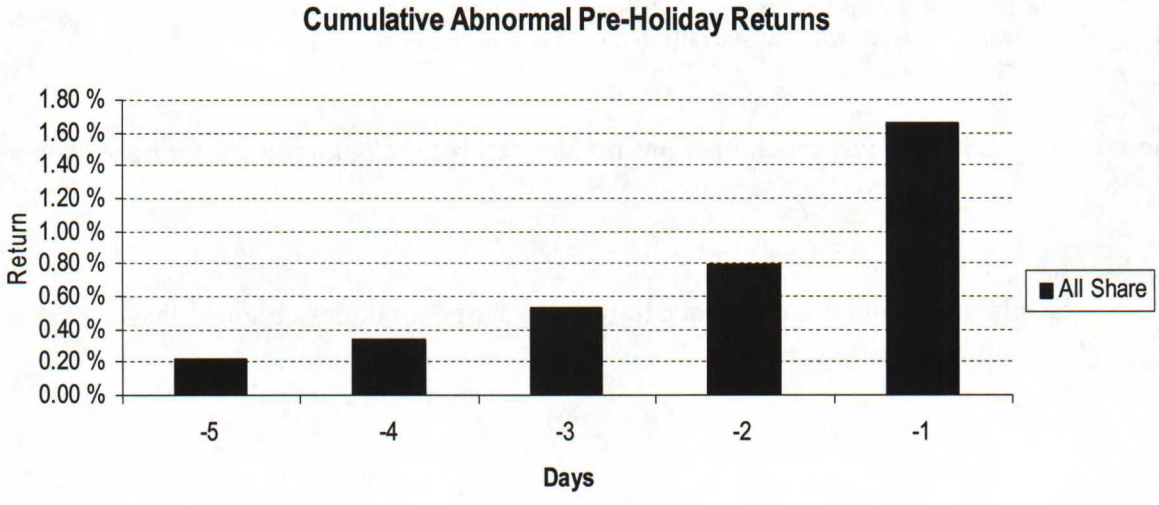


Figure 7 shows cumulative abnormal return accruing to pre-holiday (one day before the exchange is closed).

7.2 Impact of Pre-Holidays on Holding Period Return

A significant portion of the almost total 12- year cumulative return earned by market indices can be attributed to the returns earned on pre-holidays. Table 3 shows that the mean pre-holiday return exceeds the mean return on ordinary days by ratios of 32 and 45 for the All Share- and Portfolio indices, respectively. Hence, the nine pre-holidays collectively equal 288 or 405 ordinary days in their impact on annual returns. Since there are 252 trading days the average year, holiday returns will constitute a substantial fraction of the return accruing to the indices. For example, the arithmetic mean monthly return accruing to the Portfolio Index falls from 3.04% per month to 1.39% month (i.e., falls by 54.2%) if the returns accruing on pre-holidays are ignored. This is remarkable considering that the pre-holidays under review constitute only 90/3216=2.79% of total trading days. The annual continuously compounded return accruing to the Portfolio Index falls from 13.17% to 5.93% (i.e., it falls by 54.9%)[13] if returns on pre-holidays are ignored. This implies that 54.9% of the almost twelve-year cumulative return earned by the market accrued on the 2.79% of days preceding holidays during this period. For All Share Index the annual continuously compounded return falls from 19.76% to 6.15% (i.e., it falls by 68.9%). And the arithmetic mean monthly return accruing to All Share Index falls from 5.95% to 1.43% (i.e., it falls by 75.9%).

Lakonishok & Smidt (1988) find that holidays account about 50 percent of the price increase in Dow Jones Industrial Average (DJIA). Ariel (1990) reports 34.7% of the annual continuously compounded return accrued to CRSP value-weighted is earned on days preceding holidays. Easton (1990) finds that approximately 37% of the capital gains on Sydney All Ordinaries Index from 1958 to 1980 occurred on days before and after holidays.

[13] The Portfolio index almost twelve- year buy-and-hold return of 432.14% corresponds to an annual continuously compounded return of ln(1+4.3214)/11.83 = 13.17%. If returns on pre-holidays are set to equal to zero, the buy-and-hold return falls to 197.69%, implying an annual continuously compounded return of ln(1+1.9769)/11.83 = 5.93%.

7.3 Stock Returns on Days around Holidays

We can compare Table 3(A&B) and find out that high returns predominate only on the single trading day preceding holiday and not on other days around the holiday period. Figure 8 graphically depicts mean cumulative abnormal returns on five days before holidays for All Share index. For the All Share index, only the mean return on the trading day immediately before holidays differs significantly from the return on all other remaining trading days. Figure 9 represents the same information for Portfolio index. This figure helps to explain why statistical significance was not reached, when t[-1, -5] pre-holidays were tested.

Figure 8

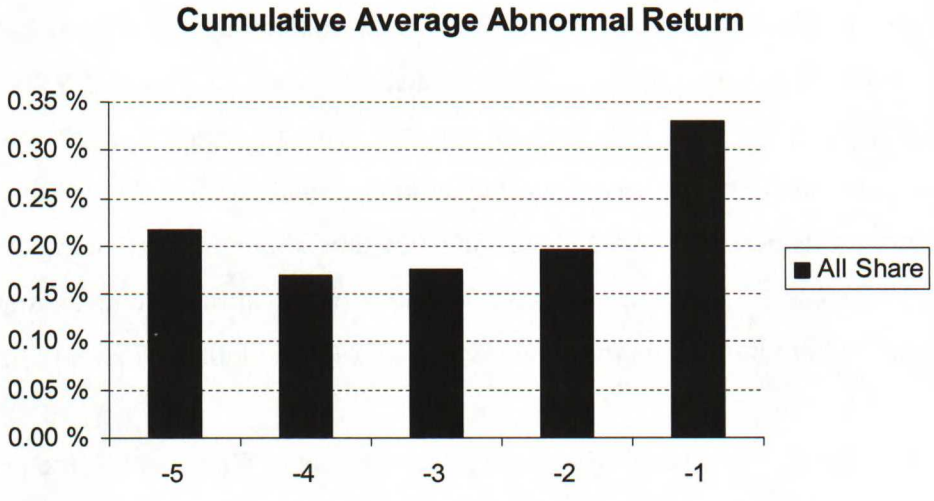


Figure 8 shows that cumulative average abnormal return is significantly higher one day before holiday.

Figure 9

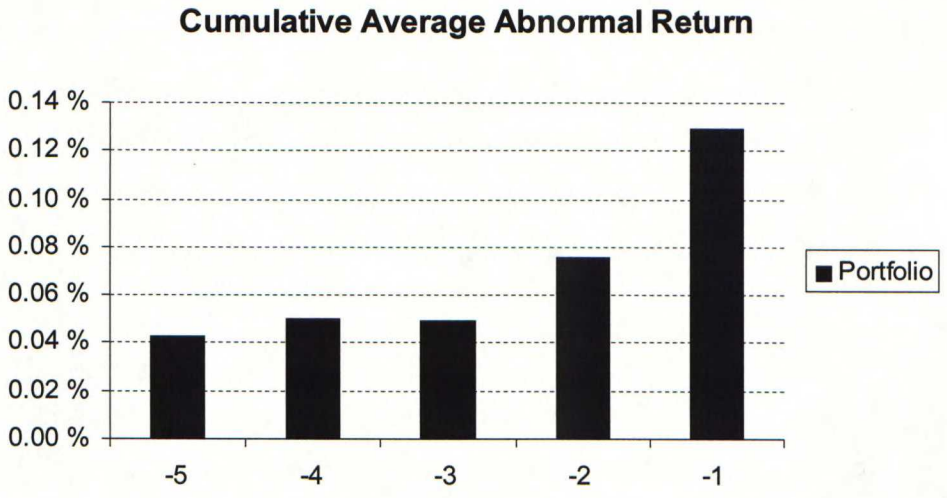


Figure 9 shows that cumulative average abnormal return is significantly higher one day before holiday.

Figure 10

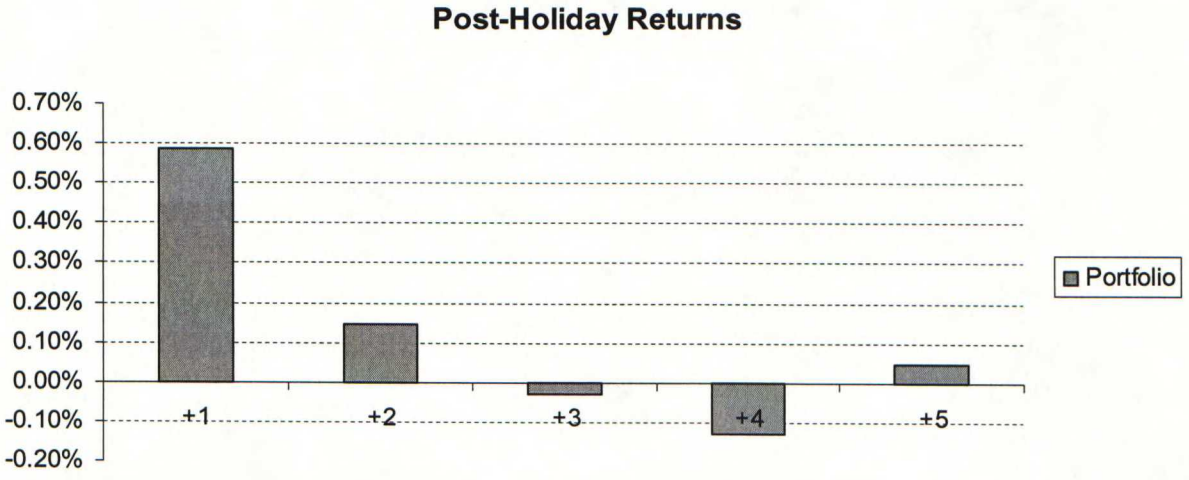


Figure 10 graphically shows the mean returns on the five days after holiday. For All Share Index, only the mean return on the trading day immediately before holiday differs significantly from the return on all remaining trading days. However, for the Portfolio Index, the mean returns on trading days immediately before and after are significantly different from return accruing to other days.

7.4 Post-Holiday Returns

As mentioned in the previous chapter, All Share Index does not show any post-holiday strength. On the contrary, for Portfolio Index, Table 5(A), also the post-holiday, $t_{[+1]}$ trading days show higher mean returns than on ordinary days. Table 7(B) further test this effect by reporting the frequency of positive post-holiday trading days relative to ordinary trading days. Although, the results show statistically significant critical values, further analysis given to this phenomenon.

As chapter 3.2 explained the January effect is known to be one of the most powerful calendar anomalies reported. The trading day following the New Year holiday is the single highest return day of the year for the equally-weighted index due to the very powerful "January Effect" on this day. [Roll, (1983a)] Before, we can make a judgment whether post-holiday exist for Portfolio Index, we exclude the New Year's Days from the holiday set. The following table shows results for post-holidays when New Year's Day is omitted.

Table 9
Stock Return Behavior around Post-Holidays t[+1], excl. New Year's Day
Means and Standard Deviations

1991-2003	All Share	Portfolio
Ordinary days		
Mean	**0.028 %**	**0.013 %**
Standard deviation	1.98 %	1.27 %
Median	0.051 %	0.043 %
Number of days	3036	3036
Post-holiday		
Mean	**0.349 %**	**0.409 %**
Standard deviation	2.12 %	1.31 %
Median	0.332 %	0.316 %
Number of days	78	78
t-statistic (vs. Ordinary)	1.36	2.62
Significant p-value	**0.18**	***0.01***
Wilcoxon test (*W*)	0.91	1.83
Significant p-value	0.363	0.068
Ratio of post-holiday returns to ordinary days	12.5	31.5
Mean of all 3216 trading days	0.066 %	0.046 %
Standard deviation of all trading days	1.99 %	1.28 %

After excluding New Year's Day from the holiday set, the results change to somewhat. Although, the t-test statistic shows significant value, the nonparametric Wilcoxon- test rejects higher returns accruing on post-holidays. The power of Wilcoxon- test is considered to be much greater than the power of t-test. To further analyze this, the frequency of positive holidays is also studied and reported.

Table 10
Stock Return Behavior around Post-Holidays t[+1], excl. New Year's Day
Frequency of Advances

	Portfolio
Positive return days among the 3218 days	1681
Fraction of positive days	0.52
Positive return t(+1) days, excl. New Year's Day	50
Fraction of positive days	**0.64**
χ^2-statistic	3.95
significant p-value	***0.047***

As a result, the frequency has decreased but still remains significant at 0.05 level. This implies that post-holiday effect exists for Portfolio Index.Interestingly, in Finland also another holiday falls in the beginning of January. Twelfth Day is right after the first trading days of the new year, this can be seen as another "New Year's Day". Earlier studies show high returns on the start of January, next also the Twelfth Day is excluded to see whether this affects to post-holiday return pattern.

Table 11

Stock Return Behavior around Post-Holidays t[+1], excl. January Effect
Means and Standard Deviations

1991-2003	Portfolio
Ordinary days	
Mean	**0.013 %**
Standard deviation	1.27 %
Median	0.043 %
Number of days	3036
Post-holiday	
Mean	**0.288 %**
Standard deviation	1.28 %
Median	0.240 %
Number of days	69
t-statistic (vs. Ordinary)	1.75
Significant p-value	**0.085**
Wilcoxon test (*W*)	0.688
Significant p-value	0.49
Ratio of post-holiday returns to ordinary days	22
Mean of all 3216 trading days	0.046 %
Standard deviation of all trading days	1.28 %

After this test it is fair to assume that post-holiday effect does not exist separately, but when it is related to January effect it shows strong significance.

In chapter 7.2 the impact of pre-holiday on holding period return is analyzed. It seems that post-holiday effect does not exist, but it is significant when related to January effect for and Portfolio Index. As pre-holiday trading days account for massive piece of the past cumulative returns it is interesting to see what is the joint effect of pre- and post-holiday trading days for Portfolio Index' historical cumulative return. The annual continuously compounded return to the Portfolio Index is 13.17%, when pre-holidays and post-holidays are set to equal zero, the annual continuously compounded buy-and hold return falls to 1.38%. This implies that almost 90% of the almost 12- year return is accrued on pre- and post-holidays for Portfolio Index. This is quite remarkable because this implies that only 180 days during the past 12

years explain almost 90 percent of the cumulative return for that time. However, it is important to notice that the daily re-weighting of stocks in value-weighted stock portfolio results in a severe upward bias which is very significant when daily returns are chained together to yield compounded returns.

Figure 11

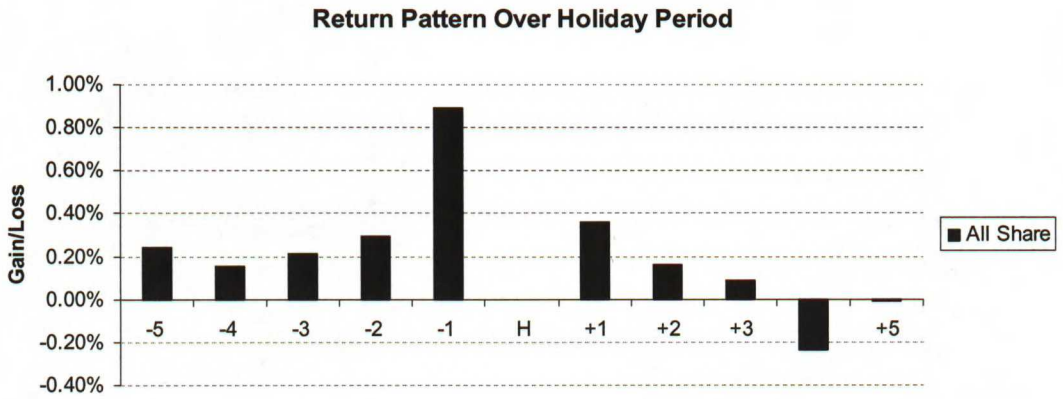


Figure 11 presents the typical return pattern on pre-holiday trading days [-1, -5] and on post-holiday trading days [+1, +5].

Figure 12

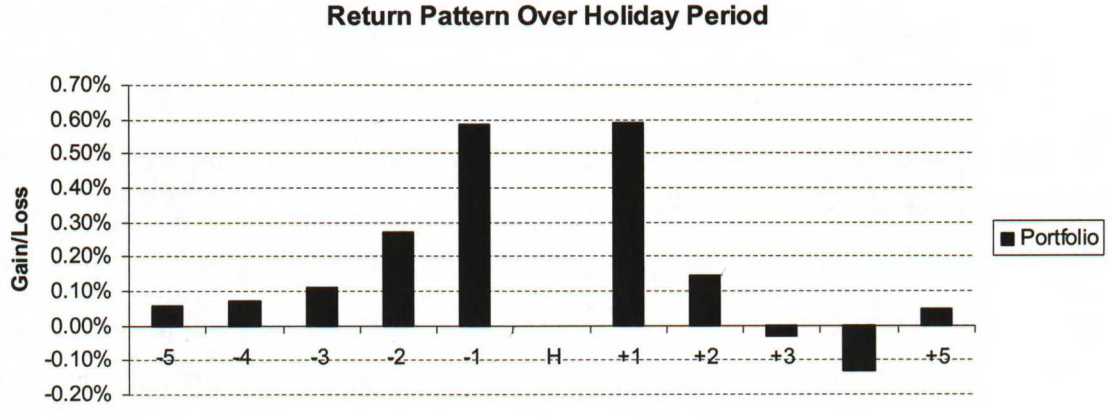


Figure 12 explicitly presents the high post-holiday returns on Portfolio Index when January holidays are included.

7.6 Finnish Holidays

There are nine public holidays when the stock exchange is closed on days when trading would normally occur but does not. Some of the holidays are global by nature, Christmas for example, some other holidays are on the other hand traditional local holidays that have significance mainly to local people. One of the reasons provided for holiday effect, is that U.S. institutions trading globally generate it. This might apply for global holidays but by excluding them from analysis and concentrating only for local holidays should clear the picture a bit. Results for Finnish holidays are stated in the following tables.

Table 12
Stock Return Behavior Around Finnish Pre-Holidays t[-1]
Means and Standard Deviations

1991-2003	All Share	Portfolio
Ordinary days		
Mean	**0.028 %**	**0.013 %**
Standard deviation	1.98 %	1.27 %
Median	0.051 %	0.043 %
Number of days	3036	3036
Pre-holiday		
Mean	**0.894 %**	**0.589 %**
Standard deviation	2.46 %	1.61 %
Median	0.509 %	0.452 %
Number of days	53	53
t-statistic (vs. Ordinary)	2.51	3.71
Significant p-value	***0.015***	***0.013***
Wilcoxon test (*W*)	2.27	1.93
Significant p-value	0.023	0.054
Ratio of pre-holiday returns to ordinary days	31.9	45.3
Mean of all 3216 trading days	0.066 %	0.046 %
Standard deviation of all trading days	1.99 %	1.28 %

Table 12 shows very high mean returns for both indices, they are surprisingly close to average return for all holidays. However, statistical significance of these result is not so strong as it is for all t[-1] holidays. This is due to increased variances of return also the median return is lower for Finnish pre-holiday trading days compared to all holidays combined. A closer look at variances reveal that there has been one totally abnormal pre-holiday trading day when All Share index plunged over eight percent and Portfolio over six percent, respectively. Thorough consideration has to be used when certain observations are excluded, but just out of curiosity if this day is omitted, the Finnish pre-holiday returns for All Share Index average over one percent return with standard deviation of near to two percent.

However, next the frequency of positive returns is analyzed based on all actual observations.

Table 13
Stock Return Behavior around Finnish Pre-Holidays t[-1]
Frequency of Advances

	All Share	**Portfolio**
Positive return days among the 3218 days	1681	1681
Fraction of positive days	0.52	0.52
Positive return days among 53 t(-1) days	38	35
Fraction of positive days	**0.72**	**0.66**
χ^2-statistic	7.14	3.50
significant p-value	**0.007**	**0.061**

The frequency of positive returns shows high statistical significance for All Share Index but is somewhat lower for Portfolio Index. Still, 66 percent of observations for Portfolio Index yield positive return on Finnish pre-holidays.

7.7 US Holiday Returns

One of the study questions is whether U.S. holidays have any effect on Finnish stock return pattern. Table 14 reports U.S. holidays returns observed in Finnish stock markets at certain dates when U.S. stock markets are closed due to holiday but open in Finland.
The relationship between Finnish stock returns and U.S. holidays are examined below. Next, statistical test are performed. Table 14 reports that U.S. holidays do not cause holiday effect in Finnish stock markets.

Table 14
Stock Return Behavior Around US Pre-Holidays t[-1]
Means and Standard Deviations

1991-2003	All Share	Portfolio
Ordinary days		
Mean	**0.028 %**	**0.013 %**
Standard deviation	1.98 %	1.27 %
Median	0.051 %	0.043 %
Number of days	3036	3036
Pre-holiday		
Mean	**0.398 %**	**0.318 %**
Standard deviation	1.745 %	1.214 %
Median	0.187 %	0.189 %
Number of days	64	64
t-statistic (vs. Ordinary)	1.64	1.97
Significant p-value	***0.105***	***0.053***
Wilcoxon test (*W*)	0.85	0.323
Significant p-value	0.395	0.747
Ratio of pre-holiday returns to ordinary days	14.2	24.5
Mean of all 3216 trading days	0.066 %	0.046 %
Standard deviation of all trading days	1.99 %	1.28 %

This result is in line with results of Cadsby and Ratner (1992) who find that all countries exhibiting pre-holiday effects do so with referece to their own local holidays. Hong Kong is the only market that is found to exhibit significant U.S. pre-holiday returns.

7.8 Analysis of Trading Volume

A strong pre-holiday effect is observed in Finnish stock markets. In this part of the study daily trading volumes are analyzed to give further explanations for drivers of the phenomenon. The pre-holiday and post-holiday volume is simply the trading volume for the trading day before and after the holiday, respectively. The non-holiday trading volume is the average trading volume of the other days, excluding pre- and post-holidays.

The empirical literature suggests that trading volume is positively correlated with stock returns. Given that the pre-holiday effect is found in periods of positive returns, if there is a relation between volume and stock returns, volume on pre-holidays would be higher than volume on the remaining days. To detect possible abnormal trading volume (ATV) in the days prior to a holiday, the average trading volume on pre-holidays is compared to ordinary days trading volume.

Table 15

Volume and Trade Size Around Pre-Holidays
Panel A

	Ordinary Day	Pre-holiday	*t*-statistic
Average trade size €	52,802	56,665	1.149
			(0.251)
Average no. transactions	6126	6189	0.95
			(0.924)
Average no. shares per trade	3416	4075	2.103
			(0.036)

Significance levels in parenthesis

Table 15(A) shows that pre-holiday effect is not caused by abnormal trading volume.

Table 15

Analysis of trading volume when US markets are closed

Panel B

	Ordinary Day	US Closed	*t*-statistic
Average trade size €	52,802	43,971	2.389
			(0.017)
Average no. transactions	6126	4602	1.971
			(0.049)
Average no. shares per trade	3416	3040	1.086
			(0.278)

Significance levels in parenthesis

Table 15(B) shows that the trading volume is somewhat lower on days when U.S. stock markets remain closed.

7.9 Existence of Holiday Effect

7.9.1 The Independence of the Holiday Effect

Previous studies have shown different calendar anomalies in the Finnish stock market. In this section I will study whether the existence of a holiday effect in the Finnish stock market is related to them. If this were the case, the performance patterns detected on pre-holidays would only be due to those anomalies being revealed. To determine if the holiday effect is caused by the other reported calendar anomalies, a dummy variable regression is estimated to further analyze this hypothesis.

Research on the day-of-the-week effects on Finnish financial markets has been widely documented in recent years. Recent papers have showed high abnormal daily returns, above all, on Fridays. The closeness of the weekend can be related with the closeness of a holiday.

Table 16

Distribution of Holidays

	Mon	Tue	Wed	Thu	Fri	Total
Exchange Closed Holidays						
New Year's Day	3	1	2	4	2	12
Twelfth Day	1	2	2	1	3	9
Good Friday*			10	3		13
Easter Monday						0
May Day	1	3	2	2	2	10
Ascension Day			12			12
Midsummer Day				13		13
Independence Day	1	2	1	3	2	9
Christmas Eve	3	1	2	2	4	12
Total Exchange Closed Holidays	9	9	31	28	13	90
Percentage	10%	10%	34%	31%	14%	100%

*Good Friday and Easter Monday are considered as a single holiday, i.e. pre-holiday is a trading day prior Good Friday and post-holiday is a trading day following Easter Monday.

Since 13 out of 90 holidays fall on Friday, Thursday is then the last trading day of the week. It can be interesting to adjust the holiday returns for the Friday effect.

Martikainen and Puttonen (1996) report high returns for Friday in Finnish stock market. Also it is in interest to see whether Thursday has any affect for the pre-holiday effect when it is the last trading day of a given week.

To determine if pre-holiday effect is caused by the day-of-the-week effect, the daily return is regressed against the pre-holiday dummy (D_{PRE}) and a daily dummy variable (D_{DAY}), which equals one if the return occurs on Thursday or Friday and zero otherwise:

$$R_{it} = \alpha_i + \alpha_{i,PRE} D_{PRE} + \alpha_{i,DAY} D_{DAY} + \varepsilon_{it}$$

As of Panel A of the Table 17 shows, the additional return earned on pre-holiday is positive and significant for All Share and Portfolio indices. As a result, adjusting returns for day-of-the-week effect fails to reduce the significance of the pre-holiday effect.

Table 17
Calendar Anomalies
Panel A
Dummy Variable Regression Models Showing that High Pre-Holiday Returns are not Caused by (A) Day-of-the-Week, (B) Turn-of-the-Month or (C) January Effect
t-statistic in parenthesis, * denotes statistical significance at the 1% level

R_{it} = Constant	+ Thu	+ Fri	+ Pre-holiday
All Share= 0.000425	-0.00587	0.00819	0.00915
(1.192)	(-1.243)	(1.317)	(3.186)*
Portfolio= 0.000299	-0.00339	0.00586	0.00576
(1.309)	(-1.118)	(1.478)	(3.129)*

Number of studies document high returns on the last trading day of the month and few first trading days of the following month. Some holidays fall on this period systematically. For example, the May Day is at the end of April and Easter holidays sometimes fall on turn-of-the-month period as well. However, turn-of-the-year, i.e. January effect is considered separately in Panel C.

Next, to determine if pre-holiday effect is caused by the turn-of-the-month effect, the daily return is regressed against the pre-holiday dummy (D_{PRE}) and a dummy variable (D_{TOM}), which equals one if the return occurs on day before the turn-of-the-month and zero otherwise:

$$R_{it} = \alpha_i + \alpha_{i,PRE} D_{PRE} + \alpha_{i,TOM} D_{TOM} + \varepsilon_{it}$$

As of Panel B of the Table 17 shows, the additional return earned on pre-holiday is positive and significant for All Share and Portfolio indices. As a result, adjusting returns for turn-of-the-month effect fails to reduce the significance of the pre-holiday effect.

Table 17
Dummy Variable Regression Models Showing that High Pre-Holiday Returns are not Caused by (B) Turn-of-the-Month Effect
Panel B
t-statistic in parenthesis, * denotes statistical significance at the 1% level

R_{it} = Constant	+ Turn-of-the-Month	+ Pre-holiday
All Share= 0.000425	0.00665	0.00732
(1.192)	(1.209)	(3.120)*
Portfolio= 0.000299	0.00358	0.00491
(1.309)	(1.017)	(3.268)*

There is no doubt that the most studied and recognized monthly seasonality is the January effect. There are several works exhibiting that the month of January accrues the highest stock returns. For example, Berglund (1996) evidence the January effect in Finland. Berglund also finds that January effect is actually built up during the first four trading days of the year. The institutional setting in Finland is particularly interesting in relation to this finding. The Twelfth Day holiday is just a few trading days from the New Year, interestingly The Twelfth Day (a.k.a. Epiphany) is not even nearly celebrated in all countries, e.g. US stock markets open for trading this day.

To determine if pre-holiday effect is caused by the January effect, the daily return is regressed against the pre-holiday dummy (D_{PRE}) and a dummy variable (D_{NEW}), which equals one if the return occurs on day before New Year or zero otherwise and against another dummy variable (D_{TWE}), which equals one if the return occurs on day before Twelfth Day and zero otherwise.

$$R_{it} = \alpha_i + \alpha_{i,PRE} D_{PRE} + \alpha_{i,NEW} D_{NEW} + \alpha_{i,TWE} D_{TWE} + \varepsilon_{it}$$

Panel C of the Table 17 shows, the additional return earned on pre-holiday is positive and significant for All Share and Portfolio indices. As a result, adjusting returns for January effect fails to reduce the significance of the pre-holiday effect.

Table 17
Dummy Variable Regression Models Showing that High Pre-Holiday Returns are not Caused by (C) January Effect
Panel C

t-statistic in parenthesis, * denotes statistical significance at the 1% level

R_{it} = Constant	+ New Year	+ Twelfth Day	+ Pre-holiday
All Share = 0.000412 (1.155)	-0.0011 (-0.177)	0.00442 (0.912)	0.00822 (3.496)*
Portfolio = 0.000283 (1.239)	0.00197 (0.308)	0.00525 (1.772)	0.00486 (3.223)*

Finally, a general model is formed which incorporates these reported seasonal patterns into equation. Based on the reported seasonal effects and allowing relationships around these calendar periods, this model captures the joint effects of seasonal variations in stock prices. The model, which is estimated separately for each reported seasonality using robust techniques, can be stated as:

$$R_{it} = \alpha_i + \alpha_{i,PRE} D_{PRE} + \alpha_{i,DAY} D_{DAY} + \alpha_{i,TOM} D_{TOM} + \alpha_{i,NEW} D_{NEW} + \alpha_{i,TWE} D_{TWE} + \varepsilon_{it}$$

Table 17
Calendar Anomalies
Panel D
Dummy Variable Regression Model Showing the Relation of High Pre-Holiday Returns to Day-of-the-Week, Turn-of-the-Month and January Effect

t-statistic in parenthesis, ** denotes statistical significance at the 5% level

R_{it} = Constant	+ Thu	+ Fri	+ Turn-of-the-Month	+ New Year	+ Twelfth Day	+ Pre-holiday
All Share = 0.000412 (1.155)	-0.00485 (-1.013)	0.00817 (1.304)	0.00659 (1.157)	0.0000942 (0.015)	0.00379 (0.768)	0.00728 (2.159)**
Portfolio = 0.000284 (1.244)	-0.00258 (-0.842)	0.00544 (1.355)	0.00427 (1.170)	0.00196 (0.482)	0.00516 (1.630)	0.00405 (1.874)***

*** t-statistic denotes statistical significance only at the 6% level

Panel D of the Table 17 shows, the additional return earned on pre-holiday is positive and significant for All Share Index. As a result, adjusting returns for other reported calendar anomalies fails to reduce the significance of the pre-holiday effect.

However, for the Portfolio Index the adjustment for other seasonalities reduces the significance of the pre-holiday effect to some extent. A closer analysis shows that pre-holiday returns prior Twelfth Day seem to play a big role in contributing to pre-holiday effect. This is very much in line with earlier results that show that January effect is stronger for small firms. In addition, Berglund (1996) finds that January effect is actually built up during the first four trading days of the year, usually pre-holiday trading day before Twelfth Day is one of them.

7.10 The Changing Nature of Pre-Holiday Effect

As well as statistical pitfalls, there is another problem inherent in using the results of the conventional approach for investment purposes. Many times it is regarded whether the results are up-to-date. Academics and investors might have different objectives. According to Lucey

and Pardo (2003) "academic are concerned with adding to knowledge in a substantive way" and statistical significance can be more important than the fact that result are out-of-date. Investors on the other hand need to be alert to changing trends. So, for investors to rely on the academic approach to testing for anomalies, the persistence and the changing nature of the effect needs to considered. If anomalies are changing over time it is prudent to review the latest evidence.

As the existence of the pre-holiday effect is assessed, additionally the changing nature of this anomaly is investigated.

Figure 13

The Changing Nature of The Pre-Holiday Effect

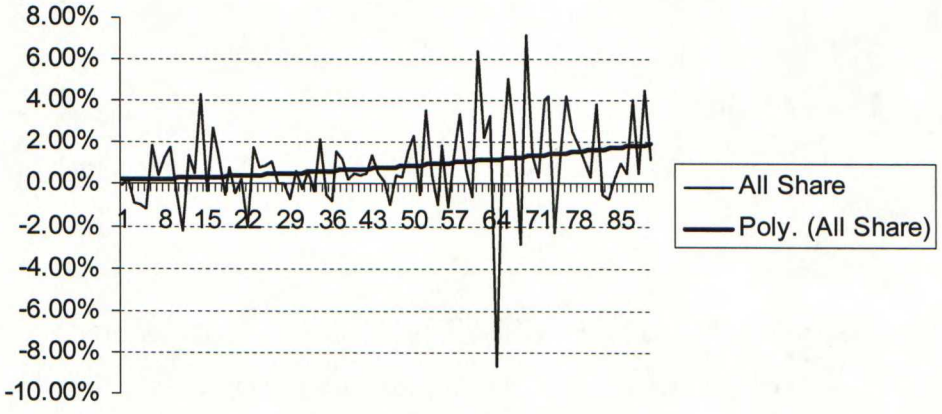


Figure 13 shows the evolution of the pre-holiday returns for the All Share Index. The vertical axis is measured in percentage pre-holiday returns. Horizontal axis makes reference to the number of pre-holidays of the period. The estimated trend is second order polynomial.

Figure 14

The Changing Nature of Pre-Holiday Effect

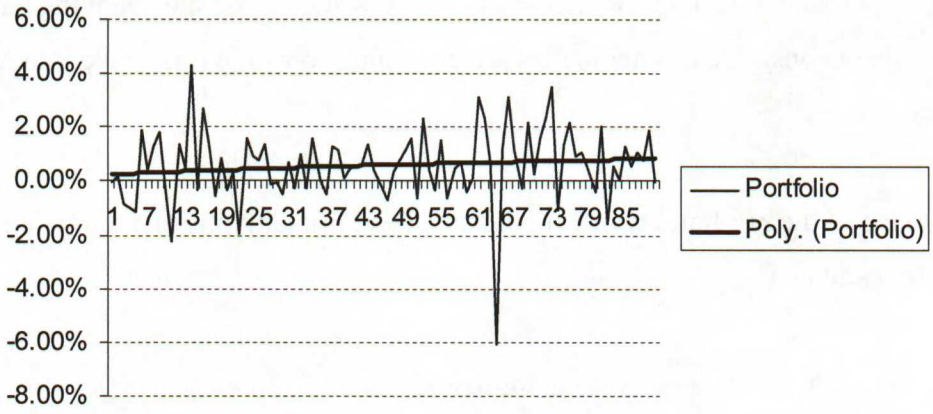


Figure 14 shows the evolution of the pre-holiday returns for the Portfolio Index. The vertical axis is measured in percentage pre-holiday returns. Horizontal axis makes reference to the number of pre-holidays of the period. The estimated trend is second order polynomial.

From Figure 14 we can conclude that the polynomial trends are never negative and that the effect shows persistence. In fact, the trend is upwards which implies that the effect is increasing.

These figures confirm the fact that pre-holiday effect is not derived from high returns many years ago which are then stopped to exist. On the contrary it can be seen as persistent trend, which is even increasing.

8 CONCLUSIONS

This study examines calendar anomaly called holiday effect in the Finnish stock market. The subject is very interesting because no previous literature has concentrated on it in Finland. The aim of this study is to provide evidence of stock return patterns and return volatilities around exchange closed holidays. Previous studies from the field are presented and results are discussed in the light of previous research that has exhibited anomalous price movements. The analysis was carried out with index data and methodologies used are similar to those in previous holiday effect studies.

The theoretical part of the study aims to build a solid ground for the empirical research. The efficient market hypothesis is the underlying theory and it is presented in the beginning of the study. It is followed by a detailed description of other calendar anomalies that could be related to holiday effect. The explanations to different anomalies are provided, although this study does not test them in practice, and focuses only on holiday effect.

The holiday effect is examined with HEX All Share and Portfolio Index data from January 1991 to November 2003. Also trading volume is studied with data from 1993 to 2003.

A strong pre-holiday effect is found for the period 1991 to 2003. This paper documents the existence of positive mean pre-holiday returns in Finland. The study examined the pre-holiday effect with two event windows: [-1] and [-5, -1]. Results show that stocks seem to return abnormally high return one day prior to exchange closed holidays for both All Share and Portfolio Index. The mean return accruing to these indices on the day before holiday is statistically significant; on average the pre-holiday rate of return is 32 and 45 times the normal rate of return for the All Share and Portfolio indices, respectively. The finding is in line with previous studies. For example, Ariel (1990) reports nine to 14 times higher pre-holiday returns for CSRP equally and value weighted portfolios compared to ordinary days.

Over 50% of the continuously compounded return accruing to Portfolio Index over the period 1991-2003 is attributable to nine trading days prior to holiday during each year. For All Share Index pre-holiday trading days make up almost 69% of its past 12- year compounded return.

The data presented here is employed to test number of possible hypotheses that seek to account for the pre-holiday strength. The frequency of positive returns on pre-holidays show that 72% of the pre-holiday trading days have positive return compared to 52% of non-holiday trading days. The equality of variances points out that regardless of larger returns on pre-holidays the variances do not increase proportionately. Volatilities are almost uniform between pre-holiday and ordinary days. This implies that there is no additional risk factor at play.

Several regression analysis tests prove that the strong tendency for equity indices to experience abnormal large returns just prior holidays is not a manifestation of other calendar effect such as day-of-the-week, turn-of-the-month and January effect. However, for Portfolio Index high pre-holiday returns may be partly explained by January effect. Tests also exhibit that high pre-holiday returns are not related to abnormal trading volumes. Analysis of the persistence and the changing nature of the effect propose that is consistent across years and holidays.

As for post-holiday trading days, the observations are mixed. The study examined the post-holiday effect with two event windows: [+1] and [+5, +1]. No post-holiday effect is observed for All Share Index, but abnormally high returns accruing to Portfolio Index on one day following a holiday are observed. This result is similar with the evidence of Pettengill (1989) and Ball and Bowers (1988) who evidence high post-holiday returns accruing to small firms. Portfolio Index returns 45 times the return of ordinary days on post-holiday trading days and exhibits statistical significance. However, further analysis reveals that the post-holiday effect for Portfolio Index is related to January effect. Finnish institutional setting differs from many countries in a sense that another holiday, Twelfth Day, falls in the beginning of the year. If post-holidays on January are excluded no statistically significant post-holiday returns for Portfolio Index are observed.

However, the joint effect of pre- and post-holidays (January holidays included) for Portfolio Index accounts for 90% of the past 12-year return. This implies that only 180 trading days explains 90 percent of the cumulative return for period of 1991-2003.

The analysis of holidays also includes U.S. holidays. Despite of high returns before U.S. holidays no statistical significance is showed.

The results indicate and the major conclusion of thesis is that anomalous holiday trading patterns exist in Helsinki Exchanges. The pre-holiday effect shows very strong statistical significance and returns close to one percent can be also economically significant due to sophisticated computerized trading programs even if transaction cost are taken into account. For active traders the strategy based on the purchase of stocks before the closing prior to a pre-holiday and then canceling them at the last moment on the following day might be a profitable trading strategy. The small investors also can benefit from this effect as sellers

they can obtain better prices if they decide to trade at the end on days prior to a holiday. Additionally, the pre-holiday effect indicates that the day prior to a holiday is the worst day to buy. However, for every investor, it might be useful to take a look at the findings of this thesis. The anomalous patterns that exist can explain most of the past returns and thus buying and selling patterns should be applied in order to benefit from these profit opportunities.

Finally, it is beyond the scope of this study to explain why pre-holiday pattern exists. Among others, information flow and closing price manipulation have been suggested to underlie the anomaly but activity at the market close can hardly be a major causal factor. Another explanation attributes pre-holiday strength to covering by short-sellers who desire to close their risky positions in advance of holidays. However, it is not clear why traders want to close short but not long positions in advance of holidays, and the high returns although not significant suggest that these short positions are not re-opened following the holiday. Further research is required to resolve the cause. Behavioral models and risk-adjusted measures such as an application of an intraday CAPM or APT are among the most interesting themes that should be examined. The intraday price behavior on pre-holidays should also be examined in more detailed manner. Whatever the reason for the pre-holiday strength, this quirk in stock returns is apparent and may need to be considered in other studies, which treat holiday-rich periods such as the turn-of-the-year.

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